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A Tour through Kamraj—Kashmir.

(Continued from last issue.)

No. 5

The Lolab is one of the most beautiful valleys in the Kashmir province; it may be briefly described as a broad circular plain, almost entirely shut in by forest clad hills, which rise directly from the level ground; in most cases the trees beginning at the very foot of the hills. There are many villages in the plain and nearly all the land is under cultivation except near Sandigam where there is a large swamp. The plain has a total length of about seven miles and is perhaps two miles broad in places; it runs from S. E. to N. W. and has a narrow outlet at the Northern end; the Southern portion being completely shut in by mountains rising perhaps 3,000 feet above the level of the valley. The whole forms as beautiful a combination of plain, river and forest—covered mountains as can be seen anywhere. There are many charming camping grounds near the forests and just sufficiently far from villages for the traveller to be free from village dirt and annoyances, while at the same time, he is near enough to them to obtain readily such ordinary supplies as he may require. The one drawback is that the river which traverses the valley is of small capacity, being well filled only during the early part of the year; later on, in the autumn, the water dries up and the valley becomes very hot and somewhat unhealthy. On the flattened summit of the range which shuts in the valley to the S. E., is the well known Nagmarg, an open space surrounded by a forest of silver and spruce fir; this is a favourite resort for travellers who stay for weeks enjoying the lovely air and scenery. Nagmarg is just above the Wular lake, which lies to the S E. immediately at the foot of the range. From the Lolab valley the lake is reached by a made road which ascends from near the village of Diur; the road is a very bad one, being merely, as is usual in such cases, an improvement of the existing *pagdandi*, though attempts have

been made from time to time to ease the gradients by constructing a new line of road. From the summit of the range, it descends at a fairly easy gradient to the village of Alosa on the borders of the Wular lake. In the lower parts, on this side, the road goes through a barren country and is consequently quite shadeless, so that whether going up or down, a start should be made very early in the morning to avoid the heat.

In former years, the Lolab was famous for its bear shooting, but the increase of sportsmen and frequent driving, have thinned them out so that they are now seldom to be seen except when driven down by snow. It has often been said that Kashmir is a country that could be colonised by Europeans and the Lolab Valley quoted as a place where they could settle, but no one can visit this region in August and September and hold to this opinion; the heat is so great that it is self-evident that no European could possibly work in the fields in the daytime; people are apt to forget that at 5,000 feet above the sea, on a plain like this, it can be exceedingly warm, so much so, that it is absurd to think of, say, retired Tommy Atkins ploughing in the sun. In fact there never was a more ridiculous idea than this Kashmir Colony scheme. In the first place there is no land available anywhere, and in the next it is far too hot and unhealthy in the Valley generally for Europeans to think of competing with natives in agricultural pursuits. Probably the only places where they could do out-door work in the Himalayas, are those at about 8,000 feet above the sea, but such places are unsuited to agriculture by reason of the altitude. One of the prettiest places in the Lolab for a camp, is the village of Andarbug and here we halted a couple of days, pitching our tents under some enormous walnut trees. It was still very hot in the day time but the evenings were charming and we enjoyed some rambles into the forest near, searching for ferns and curious walking sticks. The tour was now drawing to a close, as urgent business required a visit to Headquarters, so we up camp, and rising in the dark, got away on our ponies just as dawn was appearing and began the ascent from Diur village, to the Nagmarg ridge, and so on to the Wular lake. On the Lolab side, the road is very pretty, mounting through a deodar forest at first, and then the higher pines, while from the summit there is a great view of lake and distant mountains. The sun's rays were now beginning to be powerful, so after a brief halt, we pushed on down the hill to Alosa; this side, the road is very uninteresting running as it does through a bare country, and we did the right thing in starting so early, thus avoiding the heat: by so doing we had a pleasant march and reached the lake at a little after 9 a. m. Alosa is a rather pretty village on the shore of the lake, that is when the water is high, at present it has receded about a mile from the houses. In order to be near the boats, in which we were to embark for Srinagar, we went on to the ghat and camped there. This is a wretched collection of grass huts on a swampy

place and looked very malarious, the nasty looking nalas near being filled with rotting aquatic plants and the ground cracked in all directions by the heat of the sun. From the slopes above Alosa, which are sparsely covered with bushes of Parrotia, Beaberis, &c., comes a portion of the supply of hard wood (known as *janglu*) for Srinagar; the villager simply goes where he likes and cuts anything, bringing in so many *katbas* or pieces above 1½ feet long, to Alosa, where the contractor buys them from him and sends them on to the City. The State gets a fourth share in kind levied at one of the taxing stations. Of course, under such a primitive system, the hill sides are almost entirely denuded of forest growth and other arrangements must be made for the future. We entered our boats the same night, so as to make a very early start and cross the Wular before the wind began to blow, making the passage dangerous for these flat bottomed crafts. As our departure from the Lolab valley was a hurried one, we had to take our chance for boats, there being no time to obtain these from Sopar or Baramula; in consequence we could only get a very small one, so small that one of us had to sleep on the floor, but early in the morning we were able to change into a fine boat which had arrived from Duabgah and so we made our way back to Srinagar.

I have, during this trip seen the principal or at any rate, the most valuable forests in the Kashmir plain; there are others of great extent to be seen in the Lidar, Kuthar and Sindh valleys and towards Vernag and Gulmarg, but so far as can be ascertained, the forests of the Lolab are a long way the best deodar-producing tracts. Looking back on my tramp through these, my principal feeling is one of vain regret that they have not been under proper management during the last 30 years or more; they are of large extent, and from the reproduction to be found in many places and the general growth, it is evident that the soil is admirably suited to the growth of deodar. Had there been been no felling of young and immature trees, barking, hacking and destruction by fire, not only could the wants of the people have been supplied, but there would have been sufficient timber for a fine export trade with the plains.

Deodar has hitherto been used for work for which Kail would have sufficed, and it will now be a hard task to break though the custom. Nature has been so lavish that it is a thousand pities man should have done his little all to destroy her gifts, the wonder is that anything still remained, when it is considered that from time immemorial there has been practically no limit or check upon fellings. The only ray of light which pierces the gloom is the fact that the pure Kail forests are of great extent and have been comparatively little worked, also that there is much Kail intermixed with the deodar. By cutting out the former they will have more room, and in time the forests will contain this species alone. Every effort must be made to restrict the use

of the more valuable kind and to this end the price of the one must be raised and the other lowered if necessary for timber sold in Srinagar. But a disturbing factor is the enormous quantity of kail that is said to be required for firewood for the city; to a forester it is simply heart-breaking to see thousands of fine straight logs being taken there and split up for burning when they might be floated to the plains and sold for four times the price. This is a question which will be must carefully enquired into and every endeavour made to substitute something for the valuable timber which now goes to cook the Kashmiris, dinner. Another most difficult matter is the boatbuilding trade; hitherto boats have been built of the enormous *takhta* before described, but to the ordinary mind this is simply "unspeakable" as applied to the Turk! Not only is there a waste of timber, but trees do not now exist in sufficient quantities; there is nothing for it but a revolution in the art of boatbuilding. If these can be fashioned of huge size on the rivers in the plains, there is no reason why the like should not be done in Kashmir, but this will be declared impossible by the Kashmiri, especially when he sees Europeans who ought to know better using so-called planks, 75 feet long, to make a house boat. The natural consequence of this revolution will be extra cost in building, followed by an extra rent to be paid by the globe-trotter for his *donga*, and the cry will go up that the cheapness of living in Kashmir is a thing of the past. The Forest Department will be blamed for raising the price of timber, and it will be a wonder if they can get any one to understand that though as regards forests, Kashmir began with a fine large cake, so many slices have been cut off, that there now remains little more than the crumbs on the plate.—*Vale.*

J. C. Mc. D.

The Germination of Teak.

This large, deciduous, well-known tree is of the first importance in India, affording one of the best and most durable timbers known. It is light, easily worked and strong, and by being durable either in or out of water it has proved superior to every other timber for ship-building and countless other purposes. Much has been written on its habits and economic uses which might well, therefore, not find a place here; but there is one characteristic about its leaves which I may mention before proceeding to our legitimate subject—GERMINATION—for on it the structure and quality of the wood are said to depend.

My observations are limited, but I noticed that there are two distinct varieties of leaf. The upper side of the one is scabrous and the under side clothed with grey or tawny tomentum; but of the other, the upper side is glabrous and shining and the under

side covered with silvery scales. The former has not only a distinct rough feel, but is somewhat narrower, less ovate or obovate and gives off with greater ease a red dye when bruised between the fingers, than the latter.

From the structure of the leaf, as above described, the natives of Tinnevelly and parts of the Coimbatore District, distinguish two varieties of Teak, and they prefer the one to the other for particular purposes. I have, however, found both varieties of leaf on the same tree: but the conditions or causes which produce these morphological differences in the structure of the leaves and, doubtless, through them in the physical property of the wood, must be worth studying.

GERMINATION.—The greatest obstacle to the spread of Teak is its slow and uncertain germination, added to the fact, that as the seed ripens and falls at the commencement of the hot season, a large proportion is destroyed by the annual fires; or is washed away into the ravines and streams by the monsoon torrents; or either rots, or is destroyed by vermin during the long interval that elapses between the fall of the seed and the rains which favour its germination.

Various attempts have been made to encourage and foster natural regeneration by self sown seed by the exclusion of cattle and fires; but such attempts, as the Annual Administration Reports show, have proved futile. We are, however, indebted to the late Dr. Roxburgh, at the instance of the much lamented Mr. Conolly, Collector of Malabar, to whom the splendid plantations at Nilambur owe their existence, for its artificial regeneration in nursery beds.

Artificial germination in nursery beds :—With some slight modifications Dr. Roxburgh's suggestions are still adhered to and they are, as carried out at Nilambur, as follows :—

The soil is dug to 12″, reduced to a fine mould, levelled and partitioned into beds 32″ wide within raised edgings 4″ × 3″ to retain the water. About the middle of April the seeds, after being immersed in water 48 hours or more, are spread over the beds and covered an inch thick with fine mould. Across the beds are placed branches on twigs of the wild gooseberry (Phyllanthus Emblica) which support a layer of straw, and the beds are daily profusely watered. The seeds germinate within eight or fifteen days when the twigs and straw are removed, the water gradually reduced until the monsoon has well set in and the plants, being then from 4″ to 6″ high, are put out into the area set apart for planting. A seed bed 32 inches by 50 yards will require 120 seers of seed and some 7,000 plants might be expected.

Notwithstanding all the care bestowed upon the seed in the nursery, a large quantity does not germinate. But the chief points learnt are :—

(i). That the seed must be ensured continuous moisture for its germination, which is best done by covering or burying it in the mineral soil.

(ii). Insurance of the seedling against drought.

Natural germination of self-sown seed :—The seed by being exposed on the surface does not receive that amount of continuous moisture essential for its germination. Then again when the seed is placed even in favourable circumstances its protracted germination causes the seedling to start life so late in the season that it is much too weak and insufficiently established to meet the increased transpiration and drought which immediately follows the monsoon. A great number of seedlings are also destroyed by insects which also make their appearance after the monsoon.

Natural germination may therefore be artificially assisted by breaking up and preparing the ground in parallel contour ridges round seedling Teak trees to a radius equal to the distance the top-most seeds are likely to fall. The surface is thereby kept wholesome and porous and the seeds which fall into the trenches are covered by the ridges being washed over them during the monsoon, and the porous prepared soil allows the taproot of the seedling to penetrate deep enough into it to insure the plant against drought and increased transpiration. In the majority of cases seedlings are found in places where the seeds are covered by a layer of sand or earth, or the ground broken up and worked into nodules by earthworms or similar agency.

The advantages that the method affords are :—

(i). The localization of Teak within its own habitat and associates, which must therefore tend to raise it to its maximum usefulness.

(ii). The removal of obnoxious weeds, grasses, and undergrowth which are fast supplanting the Teak and other useful trees, and which, notably the Lantana, are over-running the forests.

(iii). It costs very much less than a regular exposed plantation, and the seedlings are less subject to drought and increased transpiration during the hot season from shade afforded by the parent trees.

The financial difficulty, which this method involves, may be overcome by sowing in the area some of the better species of cotton or cereal grains, the crops of which might go to pay in part at least, the expenditure incurred. Or the ground may be prepared free of cost by allowing the jungle tribes to raise their crops on it. Then again, it is not unreasonable to suggest that a part of the forest revenue might well be spent in improving our forests and increasing their value and utility, for nothing can be got without labour and expense.

An experiment much on the lines advocated above was made by me last year on the Anamallais. The seeds on the trees around which the ground was prepared as previously suggested, were

unfortunately picked off for sowing in the nursery beds, other seed, were therefore sown broadcast over the area with, I am told splendid results.

In tracts, therefore, where the Teak has been over-cut, seed may be sown in parallel contour furrows and thus save the enormous expenditure incurred in clearing, felling and planting the area.

In the light of the foregoing, it seems to me that in Teak tracts cattle grazing, were it not for the fires that follow in its train by the carelessness of herdmen, must tend to help the germination of the seed, in that it crops the grass and treads the seed into the mineral soil, facts eloquently borne out in Tinnevelly and other districts.

S. G. MOSS.

The Double Cocoanut of the Seychelles Islands.

The history of the Seychelles Cocoanut (*Lodoicea Sechellarum*, Labill.) is most curious. There is not a botanist who has not read about it over and over again, not a traveller to Madagascar, Réunion, or Mauritius, who has not viewed with astonishment its enormous, black, two-lobed fruit, a character that has given rise to names as strange as they are French. Ordinarily it is called "Coco de mer," because it is carried away by tidal currents and deposited on distant shores where it occasionally germinates and grows well; it is also called, "Maldive cocoanut" as it is found in those islands, transported thither undoubtedly by some current; "Solomon's cocoanut" "double cocoanut," are also names by which it is known, besides others; Rumphius mentions it in his Herbarium Amboinense as *Cocos maldivicus*, and alludes to the more or less fabulous stories about its supposed virtues—in one place it was used as an antidote to poison; in another, it was a wonderful specific against colic, apoplexy, paralysis, &c.

Without giving too much credence to the probability of these properties, it appears certain that the fruit of this palm tree fetched a high price. Travellers who were able to get it, paid £ 6 to £ 12 for a single fruit, while the largest specimens went for as high a figure as £ 18.

Precious vessels or cups were made out of the shell, and were used to hold tobacco, or betelnut. In the Maldives, the king made it a royal property, in order to present it to his favourites and the theft of one of these cocoanuts was a capital crime.

Vague ideas prevailed for a long time concerning the appearance of this tree in its native country, its size, leaves, stem, &c. But the discovery of the Seychelles islands in 1743 put an

end to these doubts. People soon found out that it was indigenous on the islands of Praslin, Curieuse and Ronde. Sonnerat described it botanically in his Voyage to New-Guinea, and brought it with him to Réunion. Commerson continued the observation and then Labillardière, who gave it its present name, and then Quean de Quincy, Governor of the Seychelles; but it was not until Messrs. Harrison and Telfair were enabled to send flowers and fruit preserved in spirits to Sir W. M. Hooker at Kew, that the complete botanical study of this curious plant could be undertaken.

The Lodoicea is found on the mountainous parts of the three islands mentioned above, where it grows on rocky soil in company with *Cocos nucifera*. Its majestic stem, 50 to 70 feet high as a rule, sometimes reaches twice this height, crowned with a magnificent head of leaves sixteen feet long and more. Travellers describe its appearance as noble, but somewhat melancholy. The young leaves while still undeveloped and rolled up at the top of the stem are edible, like those of the *Areca oleracea*; they are also pickled when fully grown, the broad handsome leaves frequently numbering more than a hundred on a single tree, are used in roofing, hat making, and even for thin walls. The midrib is made into brooms and baskets; the felt-like down which covers the young leaves is much valued for making pillows and mattresses

The stem is made into pipes for irrigation, or furnishes building wood, or planks for boxes.

The fruit is not merely an object of superstition or curiosity; many useful and durable articles are made out of the nut, such as dishes, plates, bowls and cups. It is frequently used for storing drinking water, each shell holding about three quarts.

When ripe, one of these enormous nuts weighs as much as 40 lbs., and measures 50 inches round, and 15 inches long. At first it was thought that they ripened annually, but more recent observations have established the fact that they take many years, probably nine or ten, to ripen.

When the ripe fruit is subjected to a temperature resembling that of the Seychelles, it germinates readily and grows quickly. During the first few years, the young plant does not in the least resemble the adult tree; it is more like some of the *Pritchardiæ* of the Pacific.

As soon as the stem is fairly formed, its base is rounded, and fits into a natural bowl or socket, which is pierced by numerous small oval holes, with hollow tubes corresponding on the outside. The roots pass through these holes and tubes, and penetrate the ground, but they never become attached to the bowl, thus having a free play and allowing the tree to sway about in the wind, a very necessary provision against violent gales. The stem forms a splendid column, perfectly straight like an iron pillar, and covered with the old leaf scars. The leaves are covered with a

thick down before they unfold, and when fully expanded are *fan shaped, ten feet long by five feet wide, though sometimes they attain a length of 20 feet and a breadth of 10.*

The colour of the leaves is shining light green, and when they fade, they bend and hang downwards along the stem before falling. The crown of foliage generally contains twenty leaves, but this number may run up to a hundred according to certain travellers, and then the whole tree forms the most splendid object it is possible to behold.

The tree is dicœcious. At the age of thirty years, it first puts forth its blossoms, the males forming enormous catkins three feet long and three inches in diameter, while the females are set on a strong zigzag stalk, covered with large reddish brown scales.

The fruit externally is covered with a thick fibrous husk, like the ordinary cocoanut. The inside, before the fruit is ripe, is formed of a kind of firm transparent jelly. Each fruit contains usually one, sometimes two or three, nuts with hard black shells, and divided at the top into two or more deep lobes.

The fruit of the Lodoicea has germinated more than once in hot houses. The first time was at Glasgow, but the young plant did not survivè. Quite recently germination has been successful in the museum of Paris, and the young plants are doing well up to date; it remains to be seen how they will fare subsequently. It would be most interesting to be able to cultivate this remarkable palm in our colony.

(Extract translated from the 'Révue Agricole' of Mauritius) by A. S.

In putting before our readers the above translation of an article from a magazine which is by no means the least interesting of our exchanges, we wish to mention that it does not seem to be generally known what large numbers of these nuts must be brought to India. In travelling last year and this, in the neighbourhood of Hardwar and Rikhikesh, both great pilgrim places on the Ganges, we noticed that all the better class of the 'fakirs' who frequent the banks of the holy river and live on the offerings of the pilgrims, carried habitually with them a black curiously shaped bowl with a handle in which they drew from the river the moderate supply of water for their day's use. We made enquiries and at last through the kindness of a brother officer procured one of these bowls for the Forest School Museum. It proved to be the half of one of the nuts of the 'double cocoanut.' Judging by the numbers we have seen, the trade must be considerable and the numbers of the nuts brought to India for sale great, for we can hardly suppose that even all those we have seen were originally washed up by the sea on the coast of Ceylon or Malabar.

The only reference we can find in books to this use of the nuts is a very short one in Dr. Watt's Dictionary where it is also said that the nuts are procurable in Bombay, at Rs. 1 to Rs. 2 each. Seemann, in his 'Popular History of Palms" says, that the Chinese considered that water kept in the shell would preserve those who drank it from every complaint; but adds, by the East Indians as by 'Europeans' "it is probable that they are now only sought as a matter of curiosity or for domestic purposes." We hope some of our readers may be able to add some further information on this interesting subject.

HON. ED.

Cutch and its Adulterants.

Cutch and the method of making it is so well-known to all the readers of this Journal, that I do not intend to describe at any length the process of its manufacture, but will content myself with a very short description.

The heart wood of the cutch tree (Acacia catechu the *Shabin* of Burma and *Khair* of India) is cut up into small chips. These chips are first all boiled in water in earthen pots for about 12 hours, the solution is poured off and boiled again with fresh chips. After this process has been repeated several times the red solution thus obtained, is poured out into an iron cauldron which contains about 12 gallons. In this it is slowly boiled until the liquid assumes the consistency of a thick paste; that is to say it is boiled in the iron pan from 10 to 12 hours. The paste thus obtained, which has a brownish black colour, is then poured out into square or oblong moulds formed usually of leaves and allowed to cool. The resulting mass is the cutch of commerce. Good cutch should be brittle and break with a dark brown or black fracture. In addition to Burma, cutch is also extensively manufactured in Oudh and Kumaon.

The amount of cutch obtained daily varies very much according as the supply of cutch wood is plentiful and near, or far off and scarce. A yield of 15 viss daily from one cauldron would be very good, a yield of 9 viss bad, but I have known cases where as few as 7 viss daily was an average yield.

The price of cutch at the present time in the local market at Thayetmyo is :—

For hard cutch	...	...	Rs. 50	per 100 viss.
„ Soft „	...	...	„ 35	„ „ „
„ adulterated cutch	..	...	„ 16	„ „ „

As the license for 1 cauldron for the year (without a reserve) is only Rs. 20; in a good locality, an enormous profit must be made. As an example of what can be made where cutch is plentiful nothing further is needed, than to say, that in one of the Tharrawaddy reserves this year, the price paid for the license for the year amounted to Rs. 660 per caldron.

The uses of the Cutch prepared as above described are numerous; by the natives of India and Burma it is largely used for chewing with the betel leaf. It is also exported extensively to Europe and America where it is used for dyeing and tanning. Medicinally, it forms a powerful astringent which is largely used in fever and other maladies.

Having given the above imperfect description of the making and more important use of cutch, it might be of interest to refer to the results of Dr. Warth's experiments made whilst on furlough in Europe during 1889-1890.

It had long been known that the makers of Kattah, as cutch is called in India, refused or were chary in using wood which contained no white spots in the heart wood. Externally they

could not tell whether the trees they were about to cut contained them or not. To determine this they cut into the trees, if the spots mentioned were not present they left them unused, thus doing much damage to the forests.

A preliminary examination made in India, shewed that the trees with the white spots yielded more of the extract than those trees which had not got them.

The active principle of cutch is tannin. The tannin of catechu forms a greenish brown compound with ferric salts. Catechin as a rule is also present, in fact pure kattah is almost entirely catechin, and it is on account of the presence of this latter that it is chewed with the betel and lime.

Catechin is soluble in hot, but not in cold water, like tannin into which it can be easily changed. Tannin however cannot be changed into catechin. Owing to this property, the two principles can be separated, but even after long standing a little of the catechin remains.

From two specimens sent from Burma, Dr. Warth obtained but 6 per cent of catechin. From the wood of the same tree that this cutch was extracted from, Dr. Warth, by a rapid treatment with concentrated solutions, obtained a mean of 22 per cent of catechin in the extract. The two specimens from Oudh, one of which contained the white spots and one of which did not, gave a mean of 38 per cent in the extract.

From the above, Dr. Warth calculated the total yield of catechin in the wood to be as follows:—

Burma.	...	...	3½%	catechin from the wood.
Oudh.	...	...	7%	„ „

F. J. BRANTHWAITE.

Obituary, A. F. Mein and W. E. D'Arcy.

We regret to have to record the deaths of these two officers, the one in England, the other in India. They both belonged to the same year and arrived in India in the beginning of 1876. Both served in Assam, Mein for his whole service, D'Arcy for a few years only, and both were known as excellent, hardworking officers.

D'Arcy was on the 49th *promotion* of Nancy students and one of his old comrades tells us that "he was the gayest and most 'social of his year and that it was always a great delight to hear 'him sing his quaint Irish songs." In India, too, he was always the best of company and had many friends. His chief service was in the Punjab where he has left a monument behind him in his Working Plans for Chamba and Changa-Manga. He was afterwards Assistant Inspector-General of Forests and then officiating Conservator in the Central Circle N.-W. Provinces.

Only shortly before his death, was published the work which had been a labour of love to him for several years, his "Note on the preparation of Forest Working Plans" which we strongly recommend to our readers.

Mein had passed the whole of his service in Assam, where the good work he did was well known. His death was caused by malarial fever contracted in the Assam Jungles.

II. CORRESPONDENCE.

A Departmental Blazer.

SIR,

I notice in the February number of the *Indian Forester* a proposal for the adoption of an Indian Forest School Blazer; like any suggestion which has for its object the assertion of the service and the formation of a close bond between its officers, I think it should receive every support from those interested. I enclose an advertisement of Messrs. Thacker and Co., Bombay, regarding a service crest for R. I. E. C. Officers, and in continuation of the Blazer scheme, I think it would be by no means a bad idea if an Indian Forest School crest was adopted. The letter I. F. S. in the form of a monogram, with a crown above and a suitable motto beneath, occurs to me as being the best design.

Z.

'Fires caused by Sparks.'

SIR,

As a little boy, it was one of my favourite amusements of a dark evening to strike together two pieces of flint and produce a "flash of fire." The larger the pieces of flint, that is to say, the more extended the surfaces of concussion, the larger was the flash. E. G. C. may any day try the experiment and convince himself, instead of puzzling himself with *à priori* reasoning and discrediting the evidence of the senses of others. He has no doubt seen glass at a red heat, and there is no reason why when two pieces of flint are violently struck together, the result may not be the scattering of a cloud of flint dust at a red heat. Given sufficiently large masses of flint and a sufficiently violent concussion, and there is no reason why an inflammable body in close contiguity may not take fire. Air cannot burn any more than flint can, yet, as everybody knows, when it is forced rapidly out of a tube with a piston, it acquires sufficient heat to set a piece of tinder on fire.

E. E. FERNANDEZ.

III. OFFICIAL PAPERS & INTELLIGENCE.

The Dehra Dun Forest School.

DISTRIBUTION OF PRIZES AND CERTIFICATES.

The distributions of certificates and prizes at this Institution came off on the 30th March, in the presence of several of the chief residents of Dehra and a number of officers of the Forest Department, who had assembled under the Presidency of the Inspector-General to conduct the examinations and deliberate on school matters. The large drawing hall of the school building was decorated with flowers, and the maps and plans drawn by the students, while in the museum and corridors were displayed the collections of plants and insects they had made.

The Inspector General of Forests, Mr. B. Ribbentrop, C. I. E., presided, and among the guests we noticed Major Begbie, 2nd Goorkhas, Mr. Leslie Rogers, Mr. McMinn, B. C. S., Revd. Mr. Reynolds and others, while the Forest Department was represented by Mr. Popert and Major Bingham, Conservators, Mr. W. H. Reynolds, Superintendent of Forest Surveys, Mr. Hearle and the School staff. Several ladies were also present.

The proceedings commenced with the reading of the report of the year by the Director, Mr. J. S. Gamble. After explaining how the last year had been one of change both in the staff of Professors and in the matter of the subjects taught, he referred briefly to the departure of the late Deputy Director, Mr. Fernandez, now engaged in reorganising the forests of the Baroda State, and the arrival of his successor, Mr. Smythies; and then expressed his acknowledgements to the school and circle staff for their help during the year. Mr. Gamble then explained how the number of students had reached a total of 75, while it was expected that another year would see nearly 100 at the school. Referring to the examinations, he complimented the successful students on their work and impressed upon them the necessity for keeping their eyes open in the forests and observing facts to illustrate the teaching they had gone through.

The performances of students in the Dehra Dún Mounted Rifles and the Athletic Sports were then alluded to. Trooper Martin's success in winning Captain Armstrong's cup at the Volunteer Sports, and F. A. Seager's good performance for the Inspector-General's prize in those of the school, were especially

mentioned. Reference was also made to the recently run five miles cross country race, for prizes presented by Mr. Eardley-Wilmot and Mr. Gamble, which were won by Daulat Ram and A. M. Walker, respectively. The list of medallists of the year was then read, the following being the recipients:—Forestry, Surveying, Forest Engineering and Botany, four medals, Amrita Lal Chatterjee; Forestry, Maung Charlie; Surveying, R. S. Bower; Herbarium, P. M. Healy; Zoology, R. C. Thompson: Lower Standard medal, Bhairon Pershad. The special prizes were won as follows:—Mr. Popert's prize for map drawing, C. W. B. Anderson; Mr. Eardley-Wilmot's prize for Entomology, R. C. Thompson; Major Bingham and Mr. Thurston's second prize for do., C. W. B. Anderson; Director's second Herbarium prize, G. V. Sarangpani; Mr. Moir's sylviculture prize, Jaimal Sing. The Director concluded his report by wishing success to passing-out students, and expressing the hope that they would continue to study Forestry and Natural History in their forest circles and not forget the teaching they had undergone at Dehra. The certificates were then presented by the Inspector General, who addressed the students as follows:—

"I have once more the privilege of addressing the students assembled at the end of the school course. In a few days these lecture halls will stand deserted and some of the students now present, will have entered upon their official careers in the different provinces of the empire, whereas others will continue their studies in a grander and larger school-room—the forest—a School which is open to every one of us and where Nature does not cease teaching to all who are willing and able to learn. Our aim at the Dehra Forest School is to teach you to understand Nature and to fit you for her lessons; and everyone who has had the fortune of listening to the words of your Director must carry away with him the convictions that the means adopted towards this end are as practical as possible. Your museum contains a collection of wood specimens, an herbarium and other collections of natural products which under the Director's fostering care, have developed to such a degree of perfection that they now rival those of the first schools in Europe. Your lectures, conducted by officers specially selected amongst the Indian Forest Staff and other scientific departments, are always illustrated by practical examples, and far more than half the course takes place in the forest. If, under these circumstances, the results of the year's examinations (which, however, in my friend Mr. Popert's opinion, exhibit a great general practical improvement over those held during the last Dehra Forest Conference in 1886) have not come quite up to our expectations, some solid reason must be found to account for this. To some extent, no doubt, the shortcomings are due to changes which took place in the midst of the course both in the method of teaching and the teaching staff; but after making due allowances, I am inclined to believe that they are to,

an even greater extent, the consequence of an insufficient knowledge of mathematics when you entered the school; for the Director and the school officers assure me that, on the whole, you have not been wanting in industry. I sincerely trust that a gradual progress and improvement will take place, and I have received in this respect rather favourable reports regarding the junior class. I hope that my admitting this will act as an incentive to further exertion—for I warn you it lies in the nature of things that the demands made by the Board of Control will rise with the progress of time. As I have already pointed out, we demand more now than we expected five years ago and still are not quite satisfied. To those students who leave Dehra with a certificate in their pocket, I sincerely wish a happy and prosperous career, but I should be wanting in my solicitude for the school and perhaps more so for the service in general, if I kept silence on the question of future prospects, which might otherwise be misunderstood. Thanks to the latest reorganisation, there will, including Bombay, continually be 126 appointments in the Provincial service, ranging from Rs. 200 to Rs. 600, and these appointments will be open to passed students of Dehra and Poona only, but the fact must not be overlooked, that the main strength of the service, recruited from the schools of Forestry in India, must ever lie in the class of rangers. The principle which underlies the whole organisation of the Provincial services is that officers must work their way to the higher appointments through the grades of rangers, and consequently, in the near future, as qualified candidates for the higher posts become available, provincial patronage must give place to seniority and competitive merit in the practical working of the forests. In conclusion I may, however, inform you that a reorganisation of the ranger class is under contemplation, and that I anticipate considerable improvements in this respect."

The Director then called on the students to shew their appreciation of the visit of the Inspector-General, to which they responded by giving three hearty cheers and the proceedings closed with cheers for the Director, the Professors of the school, and the ladies.—(*Pioneer.*)

Forest products used in Soap making.

The North-West Soap Company, Limited, Meerut, has recently sent to the Reporter on Economic Products to the Government of India, for transmission to the Imperial Institute, London, the following specimens illustrating their manufactures:—

(1) Soap prepared with 10 per cent. Eucalyptus oil from *E. Globulus* grown on the Nilgiris.

(2) Soap prepared with 10 per cent. of Turpentine prepared at the Forest School Dehra Dún.

(3) Mottled Soap made from tallow and cocoanut oil, and free from rosin.

(4) Pale yellow bar Soap prepared with tallow, cocoanut oil, and rosin of American manufacture.

(5) Household Soap prepared from tallow, and rosin manufactured at the Forest School, Dehra Dun.

The soap prepared with the Dehra-made rosin is reported as being darker in colour, but otherwise of nearly as good quality as that prepared with American rosin.

We are indebted to Mr E Thurston, the Reporter for the above. Hon. Ed.

The Forest Budget of 1892-93, extract from the Finance Minister's Statement.

FOREST.

The figures are—		Accounts, 1888-89. Rx.	Accounts, 1889-90. Rx.	Accounts, 1890-91. Rx.
Revenue	...	1,349,047	1,486,303	1,448,002
Expenditure	...	7,92,000	780,035	784 113
Net	...	557,047	706,268	663,889
		Budget Estimate, 1891-92. Rx.	Budget Revised, 1891-92. Rx.	Budget Estimate, 1892-93. Rx.
Revenue	...	1,511,100	1,497,800	1,567,200
Expenditure	...	905,700	879,800	970,500
Net	...	605,400	618,000	596,700

The financial results of Forest administration are expected to remain much the same as was estimated in March last. There has been a considerable increase of Revenue compared with the previous year, but the Expenditure has also increased. For next year a similar result is expected.

Budget estimates of the Forest Department for 1891-92.

It seems rather strange to receive these on the 30th April, 1892, just one month after the year to which they relate is at an end. It might have been interesting to have had those for 1892-93 which ought to be out by now and whose figures in totals we have already seen in the Finance Member's Statement. The various Resolutions contained in the Volume before us, bear dates between October 31st, 1890, (Andamans) and March 4th, 1891, (Bombay)—Madras is not included, why, we cannot say—but the Government of India Review is dated January 14th, 1892 and the Volume reached us April 30th, 1892. The figures speak for themselves. We need not refer in detail to the contents of this book, for in a very short time, we presume, the actuals for 1891-92, will be known, and the book become scarcely more than waste paper; all we need say is that the following are the latest figures of the estimates.

Revenue	...	...	Rs. 1,55 52,000
Expenditure	...	...	„ 92,55,000
	Surplus	...	„ 62,97,000

In 1889-90, the Surplus Revenue was about seventy-three lakhs, in 1890-91, sixty-six lakhs, and the falling off for 1891-92, is said to be due to the stagnation of the teak timber trade and the consequent fall of Revenue in Lower Burma.

IV. REVIEWS.

The Agricultural Bureau of S. Australia.

Agriculture in South Australia is apparently managed by a 'Bureau' or Board of ten Members with a Secretary. The Chairman is the Hon. W. F. Krichauff, well-known for the interest he takes in Forestry and all subjects allied to it. Branch Committees have been established at various important places in the Colony and a yearly Congress is held in Adelaide at which papers on Agriculture, Horticulture and Forestry are read, the list of such papers which we find in the Report for 1890-91 now before us, containing many whose titles look as if the articles were sure to to possess considerable interest. Naturally, in the Report of a Board which concerns itself chiefly with Agriculture pure and simple, there is not much of interest to ourselves; but we note the large increase in late years of the area under vine-cultivation, which at the end of 1890 amounted to 9,570 acres with

an outturn of 762,76 gallons of wine. The Government, we see, proposes to obtain from Europe, as did recently with such success the Government of the Cape Colony, an expert wine cultivator, in order to try and improve the quality of the out-turn.

Olive-cultivation has also attracted the attention of the Bureau so that during the year under review, the outturn of oil was 6,838 gallons. The drying of figs has also been started, as well as the new system of desiccating fruit and vegetables.

Much of the time of the Bureau has been occupied by the discussion of the measures to be taken to combat the pests, both animal and vegetable, which are destructive to Agricultural plants Against the Codlin moth *(Carpocapsa Pomonella)* so destructive to apple-trees, spraying with 'London purple,' 1 lb. to 150 gallons of water, has proved effectual ; while the destructive 'red-rust' of cereal crops has, so far, baffled all attempts to destroy it. A solution has, however, been discovered, which the Bureau recommends for the disinfection of almost any kind of plant It consists in a mixture of 5 lbs. of whale-oil soap with four gallons of hot water. We can conclude our notice of the valuable work being done by this Colonial Bureau by regretting the failure of the Arbor day celebration, for such institutions are obviously most useful to a country by the interest they excite in trees and tree planting. And we may hope also that they often lead to a greater interest in Forestry.

The Madras Forest Administration Report for 1890-91.

Just as 1891-92, had come to a close, we have received this Report ; and, as usual with Madas Reports, find the expressions of policy given by the Board of Revenue and the Government more interesting than the records of useful work and the statistics of timber and produce sales. Almost the first paragraph of the Board's Review is one of the greatest interest, and we endorse most fully the Board's sentiments as regards the necessity for capital expenditure on the forests and their hints that possibly a large increase of revenue may sometimes be obtained at the expense of the growing stock. They say :—

"*Establishment.*—The subjoined table shows the strength of the staff in the two circles :—

	Northern Circle.	Southern Circle.
'Conservators	1	1
'Deputy Conservators	4	8
'Assistant Conservators	8	7
'Sub-Assistant Conservators ...	6	8
'Rangers	24	33
'Foresters	50	77
'Forest Guards	359	396

'There was no change of any importance in the establishment during the year. Since its close, however, proposals for the increase and re-organization of both the superior and the subordinate establishments have been submitted to Government and have received the approval of the Government of India and the sanction of the Secretary of State. This new scale of establishment will be brought into force gradually in the two circles as qualified men become available; and when the full complement is entertained, the result cannot but be most marked in the more efficient protection and development of the forests and the expansion of the revenue of the department. Even with the present limited resources at its disposal, the department has realized during the year under review a gross revenue of nearly 18 lakhs; out of this, only some 12½ lakhs have been spent, leaving a surplus of 5½ lakhs, the highest on record, but it would be a mistake to consider the leaving of so large a surplus as this a matter for unalloyed satisfaction: in these early days of forest exploitation, the forests need all the money that can be spent upon them, and a surplus of nearly one-third of the total receipts is obviously much greater than it should be. For this starving of the forests, the present weakness of the staff must be held responsible, and with the full staff now sanctioned, therefore, this should be remedied, and a plentiful investment of capital in buildings, roads, demarcation, survey, &c., should be made."

In a Province where Working Plans and their wholesome restrictions on over-zeal for a large Revenue hardly exist, such an expression of opinion is most important, for if the work of Forest Officers is chiefly to be gauged by the magnitude of the surplus revenue they produce, there may be a tendency to over-cut and to neglect that gradual improvement of the capital which is one of the first axioms of good Forestry.

The area of the Madras Forests, an area which, under recent orders, must all eventually become 'Reserved' is 17,823 square miles, so that the surplus Revenue comes to something over Rs. 30 per square mile.

Much space is devoted by the Board to the question of the progress of Forest Settlement, which we need not refer to except to say that, after all, in the important work of ascertaining the rights both of Government and of private persons over the forest lands, it is clearly better to be 'slow and sure' than to be in too great a hurry and possibly omit formalities or pass over claims which might give an infinity of legal trouble afterwards. We are glad to see that the Government of Madras has been pleased by the remarks of the Inspector-General of Forests, regarding their treatment of Forest Settlement, for they say in their Review:

"When reviewing the forest administration reports of the various provinces for 1889-90, the Inspector-General of Forests

'declared that the treatment of these settlements as purely 'judicial proceedings was, in his opinion, unquestionably the 'intention and correct interpretation of the forest law, and was 'productive of the most stable and satisfactory results. In this 'view the Government concurs, and is glad to learn that the 'Inspector-General considers the Madras Forest Settlements to 'be the most perfect of any in India."

We quote the following remarks of the Madras Government on the question of opening Reserves to grazing in time of scarcity :—

"The results of the experiments ordered to be made to test 'the efficacy of the various methods of dealing with fodder 'reserves and pasture grounds will be awaited with interest. 'The development of the growth of good grasses and their syste-'matic cultivation in the forests is a matter of the very highest 'importance, and the Government is inclined to agree with the 'Conservator, Southern Circle, in thinking that it is not always 'advisable to throw open the reserves to free grazing in seasons of 'drought. It is not incumbent upon Government to provide 'pasturage for an unlimited number of cattle. The agricultural 'cattle are recognised as possessing the first claim to consideration, 'and for them the reserves must if necessary be fully utilized; 'but a large number of the remaining animals are useless for any 'purpose except for manure, and curtailment of their numbers by 'judicious restrictions upon grazing is perhaps not subject for 'regret."

And we are glad to have seen from the Reports in the public Press that this policy has been adhered to, and has apparently been generally approved.

Turning to the reports themselves, the parts which are most likely to be of general interest to our readers are those which give information on the sylviculture of the chief forest trees From the Southern Circle Report, we learn that 'Kongoo' *(Hopea Wightiana)* comes up best in Tinnevelly after clear cuttings; that Teak seedlings will not appear where the ground is hard, so that digging or some similar operation is necessary for reproduction; that 'Benteak' *(Lagerströmia microcarpa)*, Blackwood, 'Irul' *(Xylia dolabriformis)* and 'Vengai' *(Pterocarpus Marsupium)* all come up well in Malabar under protection from fire and cattle; and that generally, "It is not too much to 'assert that the more valuable timbers, *e.g.*, teak, rosewood and 'vengai, were being exterminated in all accessible forest areas 'in the southern districts, first, from want of any protection, and 'later on by heavy fellings of all mature trees without any proper 'system or care for reproduction and insufficient protection." So too, in the Report of the Northern Circle we are told that in the Kistna forests, seedlings of 'Yepi' *(Hardwickia binata)*, satinwood and 'Chiriman' *(Anogeissus latifolia)* have come up so

well in protected Blocks as to shew the most marked contrast with adjoining ones which have not been so protected; that Red Sanders in Cuddapah is in places coming up under protection to such an extent that "it is difficult to penetrate through the 'mass of young poles of various species"; that the growth of '*Dolichandone crispa*' seedlings (we suspect this should rather be 'shoots') in some of poorer Reserves of Anantapur is satisfactory; and that in the same District the additional protection of a stone wall to the Kottakota Reserve "has caused a marvellous 'growth of trees of various species." But the Board are mistaken in supposing the walls at Kottakota and Gootoor to have been built in the great famine, for it was the walls of the old Reserves in Cuddapah that were then built, those in Anantapur dating only from about 1885, we believe.

The information about artificial reproduction and experiment is rather confused, and the work would seem to have been rather too desultory to be business-like. But the season was about as bad a one as could be and a great amount of success was hardly to be looked for.

"Inventions"

Likely to 'take' and 'pay' in India and the East, is the title of a small Pamphlet of 32 pages which has just made its appearance in Calcutta and copy of which we have received. The author is a "Solicitor and Pleader, High Court," and he wants everyone to invent something, and in Part II, gives a variety of headings or subjects under which new methods are wanted. Among these we extract at haphazard the following:—easier modes for *pater* or *mater-familias* to ascend and descend from upper sleeping bunks of railway carriages; a good gum that will stick fast; good substitutes for quinine, marble and leather; a smokeless powder; flying machines; unshrinkable flannel; materials for paving our streets (why not try wood?); better *ticca gharies*, worked and lighted by electricity; new ships, medicines and "many other things two numerous to mention." We have put no notes of admiration—they can be supplied by the reader—and we will only remind the author of a well-known story:—"You have heard that A has become bankrupt?" "No, how is that?" "Well you see he *invented* something." "Oh! that quite explains it!" While the rupee remains at such a low ebb, we are afraid that few out in India will be able to afford to invent anything.

A. S.

V. SHIKAR.

Destruction of a Rogue Elephant in the Dun.

The following is the account of the death of a Rogue Elephant which for some years haunted the neighbourhood of "*Parduni*" in the "*Motichoor*" Forests in the Eastern Dun.

Having taken out a licence to shoot the "Rogue" I went to *Parduni* on the 8th instant and took up my residence at the Forest Bungalow with the intention of staying there till I got a shot.

My men went out tracking each day, but it was not until the morning of the 12th, that they came across fresh tracks. One of the men ran back to camp to give me "*khabar*," and I at once started and joined the others at half past ten o'clock. The Elephant was then 70 or 80 yards in front of us, moving on slowly, knocking down Sal trees and pulling down Bamboos on his way. He went like this for two hours and stopped in a small thick patch of young Sal trees. We were about 50 yards from him and kept watching him quietly for half an hour when he lay down to sleep and began to snore, so that we all heard him. I climbed a tree close by and watched him with my glasses as he lay. He remained there fully 1½ hours and then got up and started again destroying the trees here and there on his way and eating their bark.

We followed him as before till 3 p. m., when he apparently made up his mind to go towards water and began to walk faster. With difficulty we kept up about a mile or more, over very rough country and through heavy jungle; but at last we missed him from our sight and lost his tracks also. All this time he never once entered or crossed a ravine, but kept on walking along the old "*Hathibahar*" (the Elephant road) on the ridges of the Sewaliks where it was impossible to get near enough to shoot. Next morning, the 13th, the trackers went out again but they failed to come across his fresh tracks and returned to camp unsuccessful.

On the morning of the 14th, they went out again and luckily found his fresh tracks. After a short time they heard him knocking down a tree, and sent the "*khabar*" to me in camp. I started at about 10 a. m. from the camp, to join the trackers and reached them in an hour, the place being 4 miles off.

When I joined them, I found that the "Tusker" was not more than one hundred yards from us, as we could distinctly hear him destroying the young trees. I sent one of the trackers named Mian Achroo Singh, the son of my old Shikari, Mian Tiloka Singh, to find out in what sort of place the Elephant was and how close I could get to him. Achroo was accompanied by a Forest Guard named Fateh Singh, who was the leader in the jungle, all the time we were after the Elephant, and who behaved all through very pluckily. They went about 50 yards and saw the Rogue standing under a patch of Sal seedlings eating the bark of a Sal tree which he knocked down while they watched. Achroo remained watching and the Forest Guard came back to give the information. I followed up to the spot accompained by my Munshee, Ganga Parshad, carrying my second rifle. When we joined Achroo Singh, I saw that the animal was not standing in a good position for a shot, so we waited there under a "*Maljhan*" creeper, full ¾ of an hour before he moved on about 40 yards and stopped.

Achroo again followed, and before he had gone 20 yards from us he saw the beast, and silently beckoned to me to come up. I walked up to the spot very carefully and with my glasses distinctly saw the animal standing sideways about 35 yards from us. I left Achroo and Ganga there, and walked on carefully to a very small patch which was 25 yards from the *Tusker*, were I sat down and watched him with the glasses; Achroo and Ganga followed and sat down beside me with their rifles ready, as they were warned before hand. After 2 minutes, I brought up my rifle to my shoulder; aimed at him behind his ear and fired. The moment I pulled the trigger the brute threw back his ear, and the bullet passing through it, hit the exact spot at which I aimed and dropped him dead.

He was a fine animal 10 feet in height, 14 feet in girth, measured just behind his fore legs, and 25½ feet from the tip of his trunk to the end of his tail; his foot prints were 20" × 17" and 5 feet in circumference, and his tusks were 27 inches out from his mouth.

The rifle with which I shot the *Rogue*, was a ·500 bore magnum express by Alexander Henry of Edinburgh and London, burning 165 grains of powder, and carrying a hardened lead bullet with steel tip. The first day I was out, Mr. C. W. P., of Hardwar, was with me, and gave me the benefit of his great experience in tracking, but unfortunately he was laid up with a very bad attack of cold and could not leave camp the day the elephant was shot.

Camp Parduni,
16*th March*, 1892.

RUNBEER SINGH,
RAJAH.

A Tiger killed by Buffaloes.

A young Tiger that has for some time haunted the neighbourhood of Rampore Mandi on the Jamna in the Western Dún, and especially the buffalo grazing camp at Bagsain where that river passes through the Siwaliks, recently attacked one of the herd when the rest of them set upon him in a body and soon succeeded in killing him. The body was very badly mauled, the skin being in strips when it was found.

VI. EXTRACTS AND NOTES.

Growth of planted trees in Assam.

We have already referred (Vol. XVII. p. 463,) to the Assam Report for 1890-91, the text of which has now come to hand. The only point of any interest we can find is the record of the measurements of trees in the Kulsi Plantations given in Appendix III.

The India-rubber (*Ficus elastica*) Plantation contains 88 acres in which are 2,417 living trees the largest of which date from 1878. Their average height is 53 feet and girth 4 feet. There are also some toon (*Cedrela* species, probably *microcarpa*) the dominant trees of which are 51 feet high with a girth of 16½ inches.

The Teak Plantations show the following measurements :—

Age. yrs.	*Average girth.*
19 ...	... 42½ inches.
18 ...	... 30½ „
17 ...	... 36½ „
16 ...	... 32 „
13 ...	... 28 „
12 ...	... 19½ „
10 ...	... 20¾ „

In the Sissu Plantation 18 years old, the average height of dominant trees is 53 feet, and girth 23½ inches.

There is something unpractical about these measurements, which are on selected trees only, and consequently do not give true averages. We should like to see these Plantation measurements extended, so as to give the gradual yearly increase in amount of material.

We note that several species of bamboo are being planted and should be grateful if some Assam Officer would kindly describe the systems of planting, by seed, by offsets, &c., and the season at which planting is found to succeed best.

Aloe Fibre.

Under this term may be included the fibres obtained from a large number of plants most of which are of the same genus, and others of allied genera. Aloe, Yucca and Sisal hemp are some of the names by which these fibres are known in commerce. Though they are obtained from various species, they possess more or less similar characteristics. Among aloe-fibre-producing plants, the following are some of the best known :—

Agave americana (blue aloe), *Agave angustifolia* (aloe with small leaves), *Agave rigida*, *Agave Morrisi* and *Agave vivipara*. (Sisal hemp); *Furcræa gigantea* (Mauritius hemp) *Furcræa cubensis* (Silk grass).

The Agave is originally an American plant, but at the present day it is found naturalized in many parts of the world. In South Africa the different varieties of the plants have found a congenial home, and also in Mauritius. They are also found growing equally well in South Spain and India. The *Agave americana* (blue aloe) is the most common species found in all the above-named countries. The species has a long sword-like leaf, with parallel veins, eight to ten feet in length. The leaf terminates in a strong thorn. On account of this thorn the aloe has become a favourite one as a hedge plant, as it effectually checks the inroads of animals. In Sicily, Italy, and some parts of India many a plantation is guarded by an aloe fence. When the young suckers, which are both given off from the stem of the mother plant and produced on the long flower stalk, are put in the ground, they put forth a quick growth and become full-sized plants within three to four years of their planting. But the aloe does not flower so soon as it matures. It takes from eight to twenty years before producing the inflorescence which has a long pole-like stalk twelve to eighteen feet in length shooting out vertically from the plant, and this long flower stalk bears an immense number of branches, all of which produce flowers and at last young suckers. The fibre is found in the leaves of this plant and is very long and tough. The juice of the leaves is slightly acrid, but has a soapy character, and is sometimes used as a substitute for that substance in washing cloth, &c. The fibre obtained from this Agave has been long in use in Mexico in the manufacture of ropes and cordage, whilst in the West Indies, ropes, fishing nets and hammocks are made from it. *Agave angustifolia* is largely found in Mauritius and South Africa and resembles the *americana* in its habits and characters. *Agave rigida* and *Agave Morrisi* are almost allied to one another; the former is found abundantly in Yucatan, where its fibre is the chief article of commerce, whilst the latter variety is found in Jamaica and many of the West India Islands. The leaves of this plant are of a greyish green colour with sharp thorns set on the edges. It does not differ

much from the blue aloe in its habits and other characters. *Agave vivipara* is also known as the bastard aloe, the leaves are green but smaller in size when compared to the other aloes, being not more than three to four feet in length. It is found growing in South America where the natives hold its fibres in great esteem. Waterton, the well-known traveller of South America, says that it is of incalculable value to the natives, who always have a supply on hand. The strength of the fibre is really wonderful, and though so fine that it seems that it would snap at a touch, it is more like steel wire than a vegetable production. This plant also glows well in the north of Africa.

Furcræa gigentea and *Furcræa cubensis*—The genus Furcræa was not first included in the agave under the species fœtida, but was subsequently separately classified as a distinct one. It is known as green aloe in Mauritius and was introduced from America, the home of the aloes. The stalk of this plant is sometimes very short and sometimes long. The leaves are numerous and erect, and are about eight feet in lenth and six to seven inches broad. There is a fair demand for aloe fibre in the European market, and it has been sold in London during the last few years at prices ranging from £30 to £40 per ton. The prices vary very much according to the qualities. Among the aloes, the "Sisal" stands the highest as regards quality and value, for a ton of Sisal fibre has brought on an average £53. The cultivation of the aloe is largely carried on in Yucatan and Mauritius, and the plant is gradually coming to the front as a commercial product in other tropical countries also. The Government of Jamaica is encouraging the establishment of aloe plantations, and in Ceylon some planters have joined together with a view to trying it on a large scale, and have applied for five thousand acres of Crown forest land for the purpose, which they are to be put in possession of without much delay. The formation of an aloe plantation is not attended with much difficulty. Any dry poor land will suit it, but rocky, gravelly soil is considered to be the best for the production of the finest fibres. In moist and rich lands the plants grow so vigorously that the fibre becomes poor in quality and smaller in proportion It is also noteworthy that shade in any form is always prejudicial to the plant in all stages of its growth. It is always advisable to select vigorous specimens for the purpose of planting, and the young plants which grow around the stem are preferable for the purpose, to those which are produced in the flower stalks. The rainy season should be taken advantage of for planting purposes, not that a plantation would fail by planting in dry weather, but the plants would commence their gowth well and begin to yield earlier. The number of plants which should be put down per acre differs greatly according to the practices of the planters. While the Mauritius planters consider 1,200 per acre a fair number, in Yucatan they put down only 600. In three to four years the

plants begin to yield. The leaves are then cut close to the stems, and are made into bundles and sent for the extraction of the fibres. There are various methods in use for the extraction of fibre from the aloe leaves. In Yucatan it is extracted by Death's fibre machines with a wheel of 50 inches in diameter, 8 inch-face and 8 knives or scrapers, and driven by a 10 H. P. engine; nearly 8,000 leaves being prepared in a day. In Mauritius the natives extract the fibre by striking gentle blows on the leaf with a piece of wood. In large plantations, machines of various sorts are used, the most favourite being the "Marabal" machine. The production per acre of fibre ranges from one to two tons, and on the whole those engaged in the aloe fibre industry are obtaining very satisfactory returns.—(*Indian Agriculturist.*)

Eucalyptus Oil.

The old saying, that "It is an ill wind that blows nobody good," is being realised by the dealers in Eucalyptus oil, which is strongly advocated as an influenza preventive [without however any adequate evidence of its being more than a palliative. *Ed.*] From our contemporary, the *Chemist and Druggist*, we learn that owing to the very great demand for the oil, a parcel of a fine brand which only two or three days previously had been sold for 2*s.* 6*d.* per lb., sprung up suddenly to 4*s.* 4*d.*, since which time quotations have advanced by 6*d.* per day, or even more, till on January 20th it reached 7*s.* 6*d.*, and on the following day 8*s.* was paid for the oil of E. globulus, and it was stated that 50 lb. of the same oil had been sold during the day at 12*s.* 6*d.* per lb. At that date, nearly all holders who had any merchantable oils to sell had been cleared out, but a vessel was said to be due having a considerable quantity on board, though most of this was already sold before it had actually arrived. Since this was written, the *Ormuz* has arrived with about 2,000 lb. on board, and further supplies are expected.

Our contemporary before referred to, speaking of the fillip which the influenza scare has given to Eucalyptus oil, says, it is highly probable that in the future it will remain a regular domestic remedy, as it has become in Australia, the home of the plants, which yield it; and it is further an interesting fact, that as the reputation of Eucalyptus oil has grown in public estimation, other sources of supply than Australia have been discovered, and even in Australia the distilling industry is no longer confined

to Victoria, all the colonies now sending supplies to this country. Considerable quantities of the oil are distilled in the South of France, and as many as 20,000 lbs. of the oil of Eucalyptus globulus are now exported yearly from California.

The growth of the Eucalyptus in California is another example of how rapidly new industries are developed in the far west. The first plantation of any extent was made in 1869, when 55 acres of hill land at the back of the town of Haywards, was planted with E. globulus seedlings, to supply the want of timber, and to improve the climatic conditions of the locality. As it proved a satisfactory investment, yielding a profit of 17·50 dols. per acre per annum, which was increased as experience was gained, the example thus set was quickly followed by others. One large forest was planted seven miles south of Los Angeles, and now the Eucalyptus is found over a tract of 400 miles along the Californian coast, cultivated in fields varying up to 100 acres. The trees, which are chiefly E. globulus, grow rapidly, and form a splendid shelter; the other species grown is E. rostrata, but this is cultivated chiefly for its timber.

At first no attention was given to the distillation of the oil, and its adoption as a commercial article is thus described:—"In 1883, a Mr. George Downie discovered by accident that a decoction of Eucalyptus leaves removed the scale from boilers. He set about putting a preparation on the market, and succeeded in this. Meanwhile, he found that in superintending the manufacture of the boiler fluid, he had lost an asthmatic affection from which he had suffered for years. A friend with whom he was associated in the work was also cured of bronchitis. They had noticed the pleasant odour which came from the boilers, but they were unaware that the leaves contained a volatile body until they were told what a valuable oil they were wasting. Means were at once taken to collect it, and that with the boiler fluid was the beginning of a very respectable industry, which was ultimately taken over by the company. The factory is situated at the San Lorenzo Station, on the Southern Pacific Railway. The trees in the forests and plantations are cut down, and the leaves gathered by men called strippers. From 10 to 12 tons of leaves are operated upon daily, these yielding 1,500 gallons of boiler fluid, and 70 lbs. of essential oil. The oil is thus a big product, and during past two years, it has become so important a part of the industry, that the company have appointed a skilful chemist, under whose instructions the purity of the distillate has become greatly improved." (*John R. Jackson, in the Gardener's Chronicle*).

The Teak Trade of the Laos States.

Mr. Ernest Satow, C. M. G., read a paper on Tuesday on the Laos States of Upper Siam, before the Foreign and Colonial Section at the Society of Arts, Adelphi Street. Sir Thomas Wade. K.C B. G.C.M.G., presided, and in introducing Mr. Satow, her Majesty's Minister at Montevideo, said his chief claims to address them on the subject were that he had represented the British Government in Siam for four years, had been many years in the Consular and Diplomatic service in Japan, and was an eminent Chinese and Japanese scholar. Mr. Satow began his paper by stating that there were six Laos States in the north of Siam, in most of which British-Burmese subjects had for many years carried on an extensive trade in teak timber. In 1874 a treaty was negotiated by Siam and India in order to establish courts for trying law suits between owners and lessees of the teak forests in northern Laos. This treaty worked badly and was superseded, in 1883, by a fresh treaty concluded between Great Britain and Siam, under which a native Court was created at Chiengmai, the capital of the Laos States, for all cases, and a vice-consul was appointed to reside there and watch over the execution of its provisions and to protect the interests of her Majesty's subjects. But by the year 1885 there were great arrears of cases to be heard and this having led to much dissatisfaction, Mr. Satow deemed it advisable to undertake a journey to Chiengmai to investigate the circumstances, and, at the same time, to make some inquiry concerning the teak trade of the States This visit was the subject of the paper. After a journey of six weeks from Bangkok by steam launch on the river Me-nam, and by land from Uttradit, he reached Chiengmai, where he was hospitably received by the local chief and the Siamese Commissioner. The architecture of the principal buildings showed considerable artistic talent, especially in the direction of wood carving. With regard to the teak trade, he stated that many of the forests were worked by Asiatic British subjects, the usual terms being to take them on lease from the chiefs, paying a royalty of three or four rupees a log, besides a valuable premium. The lessees were seldom men of capital, but obtained funds at 3 per cent. a month from Indian money-lenders at Moulmein. The foresters, therefore, being mostly men of straw, frequently got into arrears with their royalties, and had to give promissory notes to the lessors. The result was that they got into difficulties, and disputes arose. The success of the forester depended entirely on the greatness of the annual rainfall. The logs were floated into the river Me-nam and brought down to Bangkok, where they were cut up at steam mills, and the wood then exported in sailing vessels to Europe. A discussion followed.—*(Timber Trades Journal).*

VII.—TIMBER AND PRODUCE TRADE.

Statement of average selling rates for timber and bamboos in Meerut, Cawnpore, Bulandshahr, Pilibhit, Bareilly, and Moradabad for the quarter ending 31st March, 1891

Description.	Timber Scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
	R. A. P.	R. A. P.	R. A. P.	R. A. P.	
MEERUT.					
Sal 10′ Tors (Poles) ...	10 0 0	20 0 0	...	...	
Sal Karris, 12′ × 5″ × 4″ ...	25 0 0	40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	7 8 0	1,210 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	25 0 0	80 0 0	
CAWNPORE.					
Sal 10′ Tors (Poles) ...	2 8 0	3 0 0	...	...	
Sal, Sain Karris, 12′ × 5″ × 4″	10 0 0	12 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	2 0 0	2 8 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	20 0 0	35 0 0	
BULANDSHAHR.					
Sal 10′ Tors (Poles) ...	...	...	...	...	
Sal, Sain &c., Karris, 12′ × 5″ × 4″ ...	...	...	...	...	
Sal bed posts, 7′ × 2½′ × 2½″ ...	...	...	...	..	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	50 0 0	
PILIBHIT.					
Sal 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sal Karris 12′ × 5″ × 4″ ...	30 0 0	40 0 0	...	...	
Sal bed posts 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	60 0 0	100 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0	...	..	
Sal Karris, 12′ × 5″ × 4″ {	50 0 0	60 0 0	...	...	
{	25 0 0	{ 35 0 0	...	...	
		{ 40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	15 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	137 8 0	
MORADABAD.					
Sal 10′ Tors (Poles) ...	20 0 0	22 0 0	...	...	
Sal, Sain, &c., Karris, 12′ × 5′ 4″ ...	30 0 0	60 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	12 8 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	100 0 0	

VIII.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.—

6th April, 1892.—*No.* 404*F.*—With reference to the Notification of this Department, No. 1348-F., dated the 29th December last, the transfer of Mr. W. M. Green, Deputy Conservator of Forests, 3rd Grade, from Bengal to Burma is cancelled.

No. 407-*F.*—With reference to the Notification of this Department, No. 1348-F., dated the 29th December last, the transfer of Mr. E. G. Chester, Deputy Conservator of Forests, 2nd Grade, from the Andamans to Bengal is deferred till further orders.

No. 410-*F.*—In continuation of the Notification of this Department, No. 1210-F., dated the 30th October, 1891, the services of Mr. E. P. Popert, Conservator of Forests, are placed permanently at the disposal of the Government of Madras, with effect from 17th January, 1892.

2.—Madras Gazette.—

29*th March* 1892.—*No.* 125.—Mr. C. G. Douglas, Deputy Conservator of Forests, First Grade, is granted Furlough on medical certificate for one year and six months, under article 340 (*a*) Civil Service Regulations.

23*rd March* 1892.—The privilege leave granted to Forest Ranger A. S. Mariapragasam Pillai in Service Order No. 30 of 1892, is extended by one month.

The privilege leave granted to Forest Ranger T. C. Malaya Pillai in Service Order No. 31 of 1892, is extended by two months.

5*th March* 1892.—*No.* 134.—Mr. F. C. L. Cowley-Brown Assistant Conservator of Forests, is posted to the Salem District, with effect from 1st April, 1892.

3.—Bombay Gazette.—

6*th April*, 1892.—*No.* 3243.—His Excellency the Governor in Council is pleased to appoint—

Mr. R. C. Wroughton to act as Conservator of Forests, Southern Circle during the absence of Mr. J. L. Laird-MacGregor, or pending

20th April, 1892.—*No.* 1711.—Mr. Waman Ramchandra Gaunde, Extra Assistant Conservator of Forests, Poona, is allowed privilege leave of absence for three months from 5th May, 1892.

4.—BENGAL GAZETTE.

2nd April, 1892.—No. 1365F.—In Notification, No. 3861 F., dated the 21st December, 1891, published at page 1077 of the *Calcutta Gazette* of the 23rd idem, posting Mr. C. C. Hatt, Assistant Conservator of Forests, to the Jalpaiguri Forest Division, strike out the words "for special duty in connection with the preparation of Working Plans."

12th April, 1892.—No. 1297F.—With the previous sanction of the Governor-General in Council, the Lieutenant-Governor is pleased to order that the following rule be substituted for Rule I of the rules made under sections 31 and 41 of the Indian Forest Act for the Sundarban Protected Forests, published in the Notification of the 5th November, 1888, at page 941, Part I of the *Calcutta Gazette* of the 7th idem, and that the revised rates now fixed shall have effect from the 1st July, 1892.

Rule 1.—No trees, timber, or any other forest produce shall be cut, sawn, gathered, or removed from the Sundarban Protected Forests without prepayment in full of the charges due thereon at the undermentioned rates, and in accordance with the following classification :—

(*a*).—Timber of the following kinds in pieces measuring eight feet and upwards in length, or three feet and upwards in girth at the thick end, shall be classed as *logs* and charged for as follows :—

Sundri—One-and-a-quarter annas per "running foot."

Pussur and *Amoor*—One anna per running foot.

Logs of any other species—One-half anna per running foot.

Pieces of wood measuring eight feet and upwards in length, and under three feet in girth at the thick end, shall be classed as *poles* and charged for as follows :—

Sundri—One anna per maund	Boat measurement.
Pussur, *Amoor*, and *Goran*—Nine pies per maund...	
Poles of any other species—Six pies per maund ...	

Pieces of wood measuring less than eight feet in length, and of which the girth at the thick end is under three feet, shall be classed as *firewood*, and be charged for as follows :—

Sundri—Nine pies per maund	Boat measurement.
Goran—Six pies per maund	
Other kinds of firewood—Three pies per maund ...	

5.—N.-W. P. and Oudh Gazette.—

30*th March* 1892.—No. 1330.—Mr. L. Mercer, Officiating Deputy Conservator of Forests, from the charge of the Saháranpur Forest Division of the School Circle, to that of the Ganges Forest Divison of the Central Circle.

30*th March* 1892.—1335.—Mr. A. P. Grenfell, Assistant Conservator of Forests, Jaunsár Forest Division, to the charge of the Saháranpur Forest Division of the School Circle.

No. 1339.—Mr. M. Hill, Officiating Deputy Conservator of Forests, from the charge of the Gorakhpur Forest Division, to that of the Kheri Forest Division of the Oudh Circle.

4*th April* 1892.—No. 281F.—In exercise of the power conferred by section 75 of the Indian Forest Act (VII) of 1878, and in supersession of Notification No. 395F, dated 27th May, 1889, the Hon'ble the Lieutenant-Governor of the North-Western Provinces and Chief Commissioner of Oudh, is pleased to make the following rules, to have effect in the Govenment reserved forests of the Kheri, Bahraich and Gonda districts of Oudh :—

Rules for the regulation of grazing, and collection of dues therefor, from the "privileged" villages adjoining the reserve forests in Oudh.

Rule I.—Unless a village agrees, as a whole, to make use of the reserved forest, none of the cattle belonging to it will be allowed to graze in the same.

Rule II.—Grazing dues must be levied according to the rates fixed by Goverment (and shown in Appendix II to these rules) on all the cattle in each village which makes use of the reserved forest for grazing purposes. Provided that the Forest Officer shall exempt the cattle of any owners which, in his opinion, never graze in the Government forests.

Rule III.—The grazing year lasts from the 1st of October, of one year to the 30th September of the next : cattle born within the grazing year are exempt from dues for the said year.

Rule IV.—Before the end of September in each year the patwari of every village which elects, under Rule II, to graze its cattle in the forests, will furnish to the Tahsíldár a nominal list (countersigned by the head-man of the village) of the cattle-owners in his village and the number of animals of each kind that each possesses, and the name of the herdsman (see Rules V and XIV) in whose charge they will be grazed : these lists will be at once sent direct to the Forest Officer, to be checked in such way and by such subordinate as he may direct.

[illegible] village, or if the

brought out any difference from the numbers shown in the original list, with date, giving number of each kind of cattle, rates of assessment, and amount of dues. Within 15 days of receipt of such slip the cattle-owner may present his objection on plain paper, to the Forest Officer, who will fix dates for hearing and disposing of such objections, as far as possible, on the spot.

Rule VII.—The lists, having been checked and objections disposed of by the Forest Officer, will be sent by the Forest Officer to the Deputy Commissioner by the 30th of November. The Deputy Commissioner shall send the approved lists to the Tahsildars, who will make over the mauzawar extracts to the head-men (who are appointed by these rules to collect the dues) for collection forthwith. The Deputy Commissioner shall at the same time fix the date on which any sum not collected shall become an arrear (being not less than two months from date of order and not before the last day of February), and the same date shall be inserted in the mauzawar extracts made over to the head-man. Each head-man will be provided with a receipt book in a printed form, and he will give each cattle-owner a receipt from this book, in which will be stated the name of the owner, the number of cattle of each kind paid for, the amount paid, and the year for which the payment has been made. The receipt forms in each book must be serially numbered before issue to the head-man. The owners are bound to produce the receipts at their villages whenever called upon to do so by an officer of the Forest Department. After the collection has been completed, the head-man will hand in the pass-book containing counterfoils to the Tahsildar, who will forward it to the Forest Officer.

Rule VIII.—For all payments made by head-men into the tahsil, the Tahsildar will grant dakhilas in the same way as for all other money received, and will send to the Deputy Commissioner a quarterly account showing the amount assessed, the amount collected and the balance due.

Rule IX.—All sums not paid by the date fixed by the Collector under Rule VII, will be considered as arears, and will be recovered in the same way as arrears of land revenue direct from cattle-owners.

Rule X.—Any cattle-owner whose name has been entered in the nominal list prepared under Rule IV, who is found grazing cattle in the Government forests after the date fixed by the Collector under Rule VII, for the payment of grazing dues, without having paid his grazing dues for the current year, and without having obtained the receipt referred to in Rule VII, will have to pay double rates and will be liable to prosecution.

Rule XI.—Any complainant dissatisfied with the Forest Of[illegible]

Rule XIII.—As soon as the Deputy Commissioner has realised the full amount of the assessments finally settled, he will send in a bill to the Forest Department for the percentages due on the collections, as follow :—

Head-man at 2½ per cent. on amount collected.

Patwari at 1 per cent. on total collections.

Itláq-navís (or other tahsil official employed to keep the accounts) at half per cent.

Rule XIV.—Every single herd must have an adult herdsman (that is, a person of over 16 years of age) in charge. A herd consists of 100 or less head of cattle, bulls or bullocks, &c., or 50 buffaloes. In mixed herds a buffalo counts as two cows, &c. For every extra 50 or fraction of 50 there must be an additional herdsman not under 12 years of age. Every adult herdsman will carry with him in the forests the pass given by the checking officer, and will produce it to any Forest Officer desiring him to do so. The additional herdsmen will always carry with them the passes for the smaller extra numbers.

APPENDIX I.

(*Front.*)

Oudh Forests. Grazing permit. Privileged village (consecutive Serial No.—).

(*Back*).

District	Herdsman's name and number
Range	Number of buffaloes
Village	Number of cows

NOTE.—If any other cattle but buffaloes and cows, &c., are to be grazed, these will be entered in manuscript either below the name of buffaloes or cows, or in place of them.

APPENDIX II.

The following are the rates sanctioned by Government for grazing by privileged villages for the grazing year :—

	Rs.	a.	p.
Camels	0	8	0
Buffaloes	0	4	0
Cows, bulls, bullocks, &c.	0	2	0
Sheep and goats	0	0	6
Ponies or donkeys	0	1	0

10*th April* 1892.—No. 1534.—The Notification from this Department, No. 1335, dated the 30th March, 1892, appointing Mr. A. P. Grenfell to the charge of the Saháranpur Forest Division, is hereby cancelled.

1542.—Mr. B. B. Osmaston, Officiating Deputy Conservator [illegible] Division of Central Circle as Work-

18th April 1892.—No. 1593.—Pandit Keshavanand, Extra Assistant Conservator, attached to the Kheri Forest Division, to hold charge of the current duties of the office of Deputy Conservatcr of Forests, Kheri Division, in addition to his own duties, with effect from the 9th March, 1892, and until further orders.

19th April 1892.—No. 897.—Under section 14 of Act X of 1882, Mr. M. Hill, Officiating Deputy Conservator of Forests, is appointed a Special Magistrate, and is invested with the powers of a Magistrate of the 3rd class within the limits of any Forest Division of which he may be in charge, for the trial of offences punishable under Act VII of 1878.

20th April 1892.—No. 923.—Under section 14 of Act X of 1882, Mr. W. Shakespear, Deputy Conservator of Forests, is appointed a Special Magistrate, and is invested with the powers of a Magistrate of the 3rd class, within the limits of any Forest Division of which he may be in charge, for the trial of offences punishable under Act VII of 1878.

6.—PUNJAB GAZETTE.—

8th April 1892.—No. 181. *Notification.*—Messrs. A. M. Reuther and A E. Wild, Deputy Conservators of Forests, respectively made over and assumed charge of the Hazara Forest Division on the forenoon of the 26th March 1892.

Mr. A. M. Reuther will remain attached to the Hazara Division till further orders.

7.—CENTRAL PROVINCES GAZETTE.—

29th March 1892.—No. 1008.—Mr. W. King, Deputy Conservator of Forests, having reported, on the 8th ultimo, his return from the furlough granted him by Notification No. 7128, dated the 10th November 1890, is posted to the Narsinghpur Forest Division.

No. 1009.—On being relieved by Mr. W. King, of the charge of the Narsinghpur Forest Division, Mr. Chunder Kumar Chatterji, Extra-Assistant Conservator of Forests, is transferred to the Hoshangabad Forest Division.

No. 1010.—Messrs. Chunder Kumar Chhatterji and W. King respectively made over and received charge of the Narsinghpur Forest Division on the forenoon of the 11th February 1892.

No. 1012.—With reference to Notification No. 1,009 dated 29th March 1892, Mr. Chunder Kumar Chhatterji, Extra-Assistant Conservator of Forests, assumed charge of his duties in the Hoshangabad Forest Division on the forenoon of the 30th ultimo.

[illegible] referred to in [illegible] March 1892 [illegible] pay double rates and will be liable to prosecution.

Rule XI.—Any complainant dissatisfied with the Forest Off[illegible]

Parliament should be asked to vote a yearly sum for redeeming such forest as can be bought back at reasonable rates. Ordinarily, when a South African forest has been "worked out," the owner thinks about selling. He may be able to turn it into maize gardens and thence into pasture, but there is a chance of its degenerating into a thorny scrub, too expensive to clear. It takes many years of profitless watching and waiting to restore such forest, but for that very reason a little money goes a long way in redeeming it A little money also will shift a good many natives to the safe side of a demarcation line. A Colonial Parliament will not lose sight of the fact that £180,000 goes yearly out of Natal to pay for imported timber

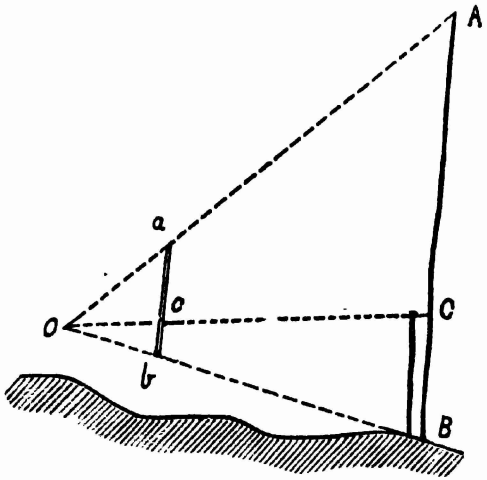
Every well-wisher of Natal—and the plucky little English Colony, with its heavy burden of blacks, has many friends outside its own borders—will congratulate it on the earnest attempt now being made to restore its forests. And students of Forestry will everywhere hail with joy this latest addition to the already large list of Colonies and dependencies of England that have broken loose from the wasteful and inartistic traditions of a country, that sees nothing worth remedying, in the barren mountains of Wales, or, in the New Forest, as it is.

It is a goodly sight to see
What heaven has done for this delicious land ;
What flowers of fragrance blush on every tree,
What gladdening prospects o'er the hills expand !
But man would mar them with an impious hand ! !

D. E. HUTCHINS.

Christen's Patent Dendrometer.

Most of the instruments of the present day used for determining the height of trees have the drawback of requiring a measured base line, and the laying out of this line, on steep ground or where there is much undergrowth is a lengthy operation which, if hurried, may result in incorrect data. This inconvenience is overcome in the Dendrometer under notice, by substituting for the measured base line, a staff of fixed length. The following is the principle on which the instrument works. Let A B. be the tree to be measured, O the eye of the observer, a b a metal rod suspended so as to assume a perpendicular position, and so arranged that the upper end at a, furnished with a sight, cuts the



line of sight O A, and the lower end at b, also furnished with a sight, cuts the line of sight O B. C B is the measuring staff placed upright against the tree, and c the point where, on the rod a b, the observer sees the top of the staff C B. Then $\frac{AB}{CB} = \frac{ab}{cb}$ and $cb = \frac{ab \times CB}{AB}$, a b on the instrument is 30 c.m. and C B is 4 m. We must therefore, according to the above formula, work out the values of c b for all possible heights of A B, mark their positions on the metal rod a b commencing from b, and with, opposite each mark, the corresponding height of A B. In practice, to measure the height of a tree, the measuring staff is held by an assistant at the foot of the tree, the rod is held between the finger and thumb of the left hand in such a position that the top of the tree is seen through the upper and the foot of the tree through the

lower sight, and whilst in this position a sight is taken at the top of the measuring staff along the line O C and the reading at c secured, which gives the height in metres of the tree at a glance. The length of the measuring staff is of course immaterial, so long as the figures in the metal rod are worked out on any given length of staff. The advantage of the new system is that it is dependent directly on to the sighting of the height of the tree and not on a measured base line and that there is much greater freedom is choice of a position from whence to take the observation, whilst if the left hand is steadied by resting it on a 5 or 6 foot staff, much greater exactitude may be reckoned on. Other recommendations are: the quickness with which observations may be made and the cheapness of the instrument which only costs 5s. 6d. With regard to accuracy, experiments have been made in measuring trees prior and subsequent to felling. For heights of 30 to 60 feet the variation was only 3 per cent. and for heights of 60 to 90 feet only 1·9 per cent. This instrument appears to recommend itself for cheapness, portability and accuracy to the notice of Indian foresters.

Extermination of Wild Beasts in the Central Provinces.

(And the system of Rewards.)

The article under this heading in the November issue, was no doubt read by all sportsmen and Foresters with much interest, since the question is such an important one.

From the perusal of it, it seems that the number of wild animals (for which rewards are offered) destroyed in the Central Provinces, steadily decreased since 1888. This is laid entirely at the door of the Shooting Rules. No doubt it is partly due to them, but the system of rewards for killing wild animals is responsible for a great deal; so much so, that many sportsmen and others who are now thinking about the matter, are beginning to doubt the expediency of giving rewards, at any rate for tigers, who are responsible for most of the mischief.

In my opinion it is in this way. Native Shikaries are, as a rule, in the Central Provinces, badly armed and are perhaps inferior marksmen. However, they are desirous of earning the reward (which is Rs. 50.) all to themselves and thus when a "Sahib" comes into the field, they do *not* do their best to enable him to shoot tigers, except in places where they are not allowed to shoot themselves, for most "Sahibs" can hardly afford to give *each* of the attending shikaries Rs. 50 as a reward when he is successful in slaying a tiger. It is this desire of Native Shikaris to earn the rewards, that very often effectually prevents the

killing of tigers, since they are not often successful themselves in doing so, while they wound a great many.

If, however, rewards for tigers were stopped, all Native Shikaris would do their utmost to help the "Sahib" in pursuit of them, since then their chief chance of getting money would be from successful sportsmen. Sahibs are nearly always well armed and are as a rule fair, if not good, marksmen, and to encourage them is therefore the quickest and most effective way of decreasing the number of tigers. The number of sporting "Sahibs" is by no means small and with a little more encouragement given to them, the forests would be flooded by sporting parties. This particularly applies to Military men who at times find great difficulty in getting natives to assist them, and they almost all, as far as I know, would prefer to see the reward for tigers done away with, in order that native shikaris should be as keen as possible for the "Sahibs" to get a tiger, while, under the present system, they are not, except as I have said before, in places where they are not allowed to shoot themselves. As it is, in order to be successful in getting tigers, the plan generally adopted is as follows :—A man is found, who perhaps knows a little about shikar and he is told that he shall have the *whole* reward for everything that is killed, besides his pay, which is generally about Rs. 25 to Rs. 30 per mensem or more. This man does nothing, as a rule himself but "screws the tails" of the poor Gond and village shikari to make them them do all the work necessary. These village or local shikaris, who know the ground, are the ones to whom all the credit is due, but although they work hard they are paid little for their trouble, while the middle man usurps all the credit and gets the whole of the reward into the bargain. These local shikaris, without whom, as a rule, sportsmen can do little, if they had shot the tiger themselves, would have got the Rs. 50 all to themselves. This is very unsatisfactory and the villager necessarily gets to look on shikar parties with dislike, if not something worse. With no reward offered, all villagers would be keen to help in the destruction of tigers, since they would have no means of making money from this source except from successful sportsmen.

I think I am right in saying, that natives are not responsible for very many of the tigers killed at present and it is doubtless a fact that they wound a very much greater number than they kill, as is testified by the old bullets found in tigers when they are shot. Of the other animals for which rewards are offered, (panthers, bears, hyenas, etc.) the greater number are probably killed by natives and, for these, it would perhaps be advisable to leave the rewards as they are.

In the case of man-eating animals, it would direct the attention of sportsmen to the places where they are at work, if a list were published monthly by the Local Government of all such places where man-eaters are reported to be. If this

is not sufficient it might be advisable, perhaps, to have some reward for man-eaters especially, in out-of-the-way places. These man-eaters, however, will steadily decrease in number if natives are encouraged to help Sahibs to kill tigers, rather than attempt to kill them themselves, which would be the case if the rewards for tigers were done away with, and then, too, less tigers would go off wounded and become man-eaters.

This may seem to some a very selfish point of view, but it is not really, if the reduction of the number of tigers is what is aimed at. I have written this only in the hope that it may be seen that the Shooting Rules are not accountable for everything as "S" seemed to make out, although it is possible that they are responsible for part, since under the old rules, no one was allowed to shoot in *Fire-protected blocks* during the fire season. One word about the new Shooting Rules. These, it must be confessed, put the Divisional Forest Officers in an awkward position. They are held responsible for the safety of their protected blocks, but under rule II (1) they should give permits between the 1st January and the 30th of June to *approved sportsmen and* shikaries for the exclusive purpose of hunting and killing carnivorous animals in those blocks. Divisional Forest Officers have, therefore, to distinguish as to who are "*approved*" sportsmen and who are not. Hence come odious distinctions which the Forest Officer is powerless to prevent. In these days of equality, he can hardly admit one and not another, without giving some reason and to admit all is out of the question, for if every one is admitted, it is "goodbye" to fire-protection. The only way is to refer all applicants who wish to shoot in fire-protected blocks to the Conservator and let him decide.

Notification No. 6211 by the Chief Commissioner, C. P., dated 27th August, 1891.

Cart and camel men are so very careless and when the forward camp is going on at night, as is the custom in the C. P., it is not to be expected they will go through dense jungle without a light or without smoking, however illegal it may be. If, however, people are admitted into fire-protected blocks it should always be on condition that two Forest Guards should accompany the camp, one with the forward camp and one with the rear camp, to see that all camp fires are extinguished and to see that cartmen do not carry a light on the road. The pay of these guards would, of course, have to be disbursed by the sportsmen whose camp they follow. It would be better if it were insisted that camps shou'd be pitched outside the fire-protected block, as most Forest Officers themselves do when on tour.

It seems hardly right that Forest Officers should be placed in such an awkward position, when the whole responsibility of fire-protected blocks lies with them.

These new shooting rules have not, as far as I know, appeared in the *Indian Forester*, and I therefore enclose a copy for insertion.

P. H. C.

No. 6211-A.—The following Rules framed by the Chief Commissioner, under Sections 25 (i) and 76 (d) of Act VII of 1878 (the Indian Forest Act), for the regulation of shooting, &c., in Government Forests in the Central Provinces, are published for general information. These Rules supersede all other Rules previously issued on the same subject under the same Sections of the Indian Forest Act.

I. The poisoning or dynamiting of rivers, streams or tanks is prohibited.

II. (1). In a fire-protected forest during the period notified in the *Central Provinces Gazette* as the fire season or in any forest similarly notified as closed for shooting against the public generally, hunting, shooting, fishing, netting or setting traps or snares is prohibited, except under a permit in writing granted by the Conservator of Forests of the Circle or by the Divisional Forest Officer. No such permit shall ordinarily be granted between the 1st of January and 30th of June exept to proven sportsmen and *Shikaris*, for the exclusive purpose of hunting and killing carnivorous animals.

(2). The permit may specify the number of elephants and camels (if any) and may limit the maximum number of retainers and followers, dogs and other animals that the holder may take with him into the forest.

(3). Forest Officers, Officers of the Central Provinces Commission, and gazetted Officers of the Central Provinces Police, having to discharge duties under the Forest Act, are exempted from taking out permits.

III. (1). Permits under Rule II granted by the Conservator of the Circle shall be valid for any forest in the Circle. Permits granted by Divisional Forest Officers shall be valid only for the district in which they are issued.

Provided that wounded game may be pursued into an adjoining district or circle.

(2). Permits are granted gratuitously and are not transferable.

(3). The holder of the permit shall observe the close seasons prescribed by the Chief Commissioner.

(4). The holder of a permit shall camp only on such regular camping grounds as may have been set apart by the Forest authorities or in places specially pointed out to him by a Forest Officer.

(5). A permit may be cancelled at any time by order of the officer granting it or by the Conservator of the Circle. Any breach of the Forest Act or of any rule made under that Act if committed by the holder of the permit or any of his retainers or followers, shall render the permit liable to cancellation. Permits are liable to be declared invalid in regard to any particular forest in case of fire breaking out in any part of that forest.

(6). The holder of a permit is not exempted from liability under the Forest Act or any other law for anything done in contravention of such Act or law or for any damage caused by him, his retainers or followers.

IV. A permit issued under these Rules does not authorize the destruction of any kind of *Bird* other than the game and edible birds included in the following list :—

Systematic Name.	Vernacular Name.
Sand Grouse.	
Pterocles fasciatus	... Bhut-titur. Dongur-kouri.
,, exustus	... Bhut-titur.
Pea-fowl.	
Pavo cristatus	... Mor Munjur.
Jungle-fowl.	
Gallus ferrugineus	... Jungly Murgh.
,, Sonneratii	... Do.
Spur-fowl.	
Galloperdix spadiceus	... Choti Jnngly Murghi.
,, lunulatus	... Do. do.
Partridge.	
Francolinus vulgaris	... Kala titur.
,, pictus	... Do.
Ortygornis pondiceriana	... Gora titur.
Quail.	
Coturnix coromandelica	... Chinuk.
Bush Quil.	
Perdicula argoonda	... Lawa.
,, asiatica	... Do.
Microperdix blewitti	... Sirsi Lawa.
Bushtard Quail.	
Turnix pugnax	... Gundru.
,, joudera	... Do.
,, Dussumieri	... Tura Dubki.
Bustard.	
Eupoditis Edwardsii	... Hoom Tokdur.
Lik-Florikan.	
Sypheotides aurita	... Tun Mor.
Spurred-Goose.	
Sarkidiornis melanonotus	... Nukta.
Goose Teal.	
Nettapus conomandelianus	... Girja.
Whistling Teal.	
Dendrocygna arcuata	... Silli.
Grey Duck.	
Anas pœkilorhyncha	... Garmpai.
Green Pigeon.	
Crocopus phœnicopterus	... Harrial.
,, chlorigaster	... Do.

Blue Rock Pigeon.		
Columba intermedia	...	Kabutur.
Doves.		
Turtur meena	...	Kulla fachta.
,, cambayensis	...	Tortru fachta.
,, suratensis	...	Chitroka fachta.
,, risorius	...	Dhor fachta.
,, senegalensis	...	Serotl fachta.
Migratory marsh and water birds, such as duck, teal, snipe, &c., which do not breed in these Provinces and visit them in the cold season only.		

V. With reference to clause (4) of Rule III, the destruction *during the close season*, of birds and animals named below, is prohibited. The close season is fixed as follows :—

For		*Close Season.*
Sand-grouse	...	1st October to 31st May.
Pea-fowl	...	1st March to 30th November.
Jungle-fowl	...	Do. do.
Spur-fowl	...	Do. do.
Partridge	...	1st May to 30th November.
Quail	...	Do. do.
Bush-Quail	...	Do. do.
Bustard Quail	...	Do. do.
Bustard	...	Do. do.
Lik-Florikan	...	Do. do.
Spurred-Goose	...	1st June to 30 November.
Goose Teal	...	Do. do.
Whistling Teal	...	Do. do.
Grey Duck	...	Do. do.
Bison (cows)	...	The whole year.
Sambar (does)	...	,, ,,
Chetul (,,)	...	,, ,,

VI. Nothing in these Rules shall prevent the disposal by auction sale, contract or otherwise of the shooting or fishing within any forest or part of a forest.

The 28th August 1891.

No. 6212.—Under Rule II, clause (1), of the Rules published by Notification No. 6211-A, dated the 27th August, the undermentioned Government Forests are hereby and until further orders notified as closed against shooting, &c., except under permit granted in accordance with the aforesaid Rules :—

	Square miles.
Area of Government Forests in the Central Provinces	20,020
Area closed under this Notification except to permit-holders	8,130
Area available for shooting, &c., without permit	11,890

Note on Turpentine,

By E. Thurston, Reporter on Economic Products.

American turpentine is imported into India from England; French or other turpentine is not known in the Calcutta market.

2. The turpentine generally sold in the Calcutta market is impure. It is largely adulterated in England with kerosene oil, naphtha, benzoin, etc., and a further adulteration takes place in India. There is very little demand for pure unadulterated turpentine. Purchasers do not look so much for quality as for quantity. Merchants, therefore, keep only small quantities of pure turpentine, which they import direct from America, not through England.

3. The points of good turpentine are that it is as clear and transparent as glass; that the odour is neither very strong nor bad; that it dries quickly; that, if spinkled on white paper, it dries at once leaving no marks behind; and that, when handled, it forms a coating of very fine white dust on the hand. All these properties depend largely on the method of distillation. Any defect in the distillation lowers the quality of the oil. If any attempt is made to introduce the Indian product into the market, the greatest care should be taken in its distillation. Its resemblance to the oil already existing in the market is of far greater importance than its purity. In point of fact, its purity must be destroyed before it is put into the market, and its resemblance to the American oil is the main object which should be kept in view. The Calcutta Merchant from whom the present information was obtained, stated that, on one occasion, a sailor brought to Calcutta, a large quantity of pure turpentine which he offered for sale, but that he had great difficulty in disposing of it, because its odour was somewhat different from that of the oil usually sold in the market. It was at length purchased by Messrs. Dykes and Company, the coach-builders.

4. For internal administration medicinally, pure turpentine is required, but consumers generally buy it from shops for external application, and demand a large quantity for their half anna or anna. In such cases, they are supplied with stuff very largely adulterated with kerosene oil.

5. It is estimated that the annual consumption of turpentine in Calcutta is from ten to twenty thousand gallons.

6. Turpentine is shipped from America to England in tin canisters packed in wooden cases, but it is sent from England to India in iron drums tinned inside—, as contact with the iron would discolour the oil.

7. At the present time the wholesale price of turpentine ranges from Rs. 1-12 to Rs. 2-9 per gallon, in Calcutta.

8. In the London market the following *are the present values* of the various turpentines imported, as well as of rosin.

American Turpentine	25s. 3d per cwt.
„ *Rosin* (common)	4s. 6d. „ „
* *French Turpentine*	none.
„ *Rosin*	„
Russian Turpentine	19s and 19s. 6d. per cwt.

American Turpentine. Average Values 1891

Jan.	29 and 29-9	July	27s. 3d. and 28s 9d.
Feb.	28-6 and 29-3	Aug.	27s. 3d. and 28s.
Mar.	28-9 and 29-3	Sept.	37s 9d. and 28s. 6d.
April	29 and 30-3	Oct.	27s. and 28s.
May	29-3 and 30-3	Nov	26s. and 26s. 9s.
June	28-8 and 29-3	Dec.	25s. 3d. and 26s

American Rosin. Average values, 1891
Common strained.

Jan.	Feb.	Mch.	April.	May.	June.
4-9	5	4-9	4-9	4-7½	4-6
July.	Aug.	Sept.	Oct	Nov.	Dec.
4-0½	4-4½	4-3	4-6	5	5

9. The Dehra Turpentine is of very superior quality but cannot at present be sold at the highest price obtained for the best imported Turpentine. It can be sold at Rs. 1-8, to Rs. 1-14, per gallon, and, if it became established in the market, could probably be sold at Rs. 2, to Rs. 2-4 per gallon.

The questions then are :—

1. Will Rs. 2 to Rs. 2-4 per gallon pay ?
2. Can the Forest Department supply the Calcutta market ?

If so it would probably pay to send a large consignment to Calcutta, and sell it at first at a loss until the quantity of Turpentine imported is reduced. The price could then be raised.

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* French Rosin or Turpentine seldom or never comes upon this Market now, so that there is no means of recording prices or averages

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We think it right to add that, in our opinion, the Dehra turpentine cannot aspire to conquer the Calcutta market which is too far away and requires too much ; all it can hope to do is to obtain a good sale in Upper India Messrs. Lyell and Co. of Allahabad are advertising it at Rs. 4-8 per gallon ; if we could get Rs 3 per gallon, all round, for Dehra turpentine, it would be worth while to build a factory and manufacture it and rosin (which fetches new Rs. 5-8 per maund) wholesale.

HON. ED.

II.—CORRESPONDENCE.

Range Officers in the Central Provinces.

SIR,

I understand that in other Provinces, Range Officers are allowed Travelling or horse allowance while on tour :—those in the Central Provinces are not allowed anything in this respect. Range Officers, to do their duties properly, have to be continually on the move and in all seasons. Some of them have to hire carts, ponies, &c., to carry their baggage; others (of the Forester's grade) cannot afford this and are in the humiliating position of taking their "belongings" on the same animal they ride. It cannot be said that this is a creditable state of affairs and the wonder is that some Conservator has not already remedied this real grievance on the part of a deserving class of officials.

It is certain that an able staff of Range Officers (whether Rangers or Foresters) is the *back-bone* of good forest administration; and it behoves Government to make the pay and position of these men equal to the responsibilities placed on them. In the Central Provinces, the majority of Range-charges are held by men of the Forester grade; therefore, in granting *travelling* or *horse allowance no distinction* should be made :—for the charges held by Foresters are, as a rule, as large and important as those held by men of the Ranger grade.

This subject is worthy the attention of the Inspector-General of Forests.

DELTA.

"The Mythology of Forest Fires."

SIR,

Several letters have appeared in the *Indian Forester* lately purporting to throw light upon the apparently mysterious origin of forest fires. Many of these are undoubtedly ingenious: and, if they have on occasions, warded off the rightful punishment which should have fallen on the conscious or unconscious incendiary or allayed the suspicions or wrath of a forest officer, they have done their duty. But, is it right that such myths should appear apparently as sober facts, in a journal advocating principles of advanced forestry, without at least calling for a footnote by the Editor,* or a suitable heading—such as, "Jokes

*Note.—Our correspondent may see, printed on our cover, a para to the effect that we do not hold ourselves responsible for the opinions expressed in papers other than Editorial. In cases of controversy, we must, as far as possible, leave our correspondents to fight for their opinions, or else we might find our Journal disappear for want of contributors. We are determined to do our best to exclude all acrimony and unpleasantness, but good humoured discussion, even with an occasional mistake,—cannot do much harm.

HON. ED.

on fires," "The Forester's explanation," and so on. Moreover, the matter appears to me to be assuming dangerous dimensions, for we shall soon have our trained Rangers and Foresters quoting the *Indian Forester* for their own ends; and, how can a poor un-Dehra-Dúned Forest officer dare to publicly disclaim such authority? We have all heard of the two gentle bamboos being rubbed together in a light breeze. That myth has, I believe, exploded. But, are our new origins of fires any wiser or more practical? To take a most widely accepted instance. I presume most forest officers would rigidly maintain and assert that forest fires can be started by throwing about a lighted cheroot. And yet, has any one ever succeeded? I most positively say—No! I do not ask for examples of instances that are supposed to have occurred, however good the evidence may be: but let any forest officer try the experiment, as an experiment, and I have little hesitation in saying that he will fail. No one will deny that this season of the year is most favourable for such experiments—yet I have been trying, and trying hard, but without success. Notwithstanding this, I have been positively assured by a most experienced forest officer in matters of fires, that he had actually started a fire, whilst engaged in plane-table work, by the cigar-ash accidently dropping from his lighted cheroot! But this is nothing, compared to the rolling stone. Will it be necessary to issue strict orders to every subordinate to remove all nails and iron-protectors from their boots?—and will it be dangerous to carry about a ferruled walking stick? And yet, has F. A. L., (I. F. Novr. '91), ever left his matches at home, and tried to satisfy his fumose longings by procuring sparks from a flint and stone, (a Gond's "chukmuk"), on dry grass, leaves, paper, and other materials available on that flinty hill-side? Let him try, and let us hope that his experiences will be recorded in the *Indian Forester*, not forgetting the exact time occupied in obtaining the desired result.

The fact is, the different manners in which a forest-fire can be started are very few, and very common place. A lighted match, (hence the real danger of smoking, hence the origin of all fires attributed to the innocent cheroot); the red-hot contents of a pipe, especially the red-hot bits of wood and dessicated rag placed on top of a "chilum," a camp-fire left burning or smouldering, sparks (*i.e.* red-hot carbon) from a railway engine; these with a very few variations, will about exhaust the list. I regret I cannot myself believe, or allow my subordinates to expect me to believe, in other mysterious origins, however clever, correct and ingenious the theory may be, as long as repeated practical experiments yield repeated failures.

C. P. TUSCAN.

30*th April*, 1892.

Occurrence of the Hamadryad in the North-West Himalaya.

SIR,

I write to ask you if you will be so kind as to identify and let me know the name of the snake of which I herewith enclose a description with measurements.

The other day, I shot a pair of these snakes within four hundred yards of each other.

L. K. MARTIN.

Measurement and colour of a poisonous Colubrine snake killed in the Palain Valley of the Garhwal district.

Total length	10' ft. 8½ in.
Tail	22½ in.
Greatest girth	8½ in.
Neck	5¼ in.

The measurements are accurate, being taken immediately after the snake was killed and again after all muscular movement had stopped.

COLOUR OF UPPER SURFACE.—Head and back a dirty yellow grey with bands of bright yellow ¾ in. wide and 3 in. apart all down the body.

COLOUR OF UNDER SURFACE.—Throat a very pale salmon, changing to bright yellow along the belly and again changing to dirty black towards the lower extremity.

Loreal scale absent and poison fangs large and distinct.

Rises like a cobra showing a true hood which is perhaps a little longer but not quite so broad as that of the cobra. No. 2 could not be measured.

I have, on three previous occasions, killed, in the neighbourhood of Naini Tal, a snake of similar shape but smaller and of brighter colour:—between 8 feet and 9 feet long of a dull black, with brilliant bands of gold all down the body. The size and colour may perhaps vary with the locality.

I noticed a curious thing about one of those I shot at Naini Tal. It was trying to swallow another snake when I shot it, perhaps they prey on other snakes.

I have heard it called the king cobra.

I was only able to measure one, the other got under some rocks after I shot it: but it was quite as long, if not longer, than the one measured.

There can be no doubt but that the snakes referred to by our correspondent, were the 'Hamadryad,' *Ophiophagus Elaps*, whose occurrence in the North-West Himalaya is interesting. See recent letters in the *Pioneer* on same subject.

HON. ED.

III.-OFFICIAL PAPERS & INTELLIGENCE.

Note on Lucerne Cultivation as practised at the Babugarh Depôt, and later at Poona Experimental Farm.

Lucerne (*Medicago sativa*) belongs to the Leguminosæ, and like many forage plants of that natural order, sends its long tap roots deep into favourable sub-soils, particularly those of a calcareous character. It is recognized as one of the most valuable fodder plants, resisting drought in an extraordinary way in those countries where it is grown without artificial watering. It shows its best results, however under irrigation, and with a liberal application of suitable manure. In the neighbourhood of many military stations in India it is extensively cultivated and is sold at a high rate to form part of the daily ration of horses in hard condition. To milch cattle it can only be sparingly fed, ten pounds, the daily allowance for a horse, being also about the maximum quantity that can safely be fed to a milch cow. Its tendency to cause tympanitis is the danger that has to be guarded against in giving it to ruminants

I believe there is a better method of cultivating lucerne than that ordinarily practised. The usual plan is to broadcast the seed on a clean well prepared seed-bed, 16 to 20 lbs. per acre. Beds about 10 feet square are formed by raising a small ridge round each compartment with a hand-rake after the seed is sown. This operation also serves to cover the seed. A through water gutter runs between each double line of beds. These water channels are therefore about 20 feet distant from each other. Their arrangement is regulated, however, by the evenness or otherwise of the field surface. Each compartment is flooded in turn, either by directing the water from an adjacent water channel or by temporarily breaking the divisional ridge between two beds, so that water can pass from the one to the other.

Lucerne planted in this manner will yield heavy cuts for two or at the most three years. Meantime the land becomes foul with deep-rooted grasses and other weeds which the cultivator is powerless to suppress, and on this account the lucerne fails when it ought to be in full vigour. In this respect the country method resembles lucerne cultivation in England, where the plant is grown in rows on the flat, 12 to 18 inches apart. By this process also the

crop is smothered after 3 or 4 years by a growth of twitch and weeds in spite of periodical horse-hoeing.

It is important that the crop when fully established should last, because the initial cost of laying it down, and subsequent outlays in manures are a like heavy. Seed alone costs Rs. 1-8-0 per lb. or Rs. 24 to Rs. 30 per acre. Regular watering, except in the rains, is important. The crop thrives best in a friable loam with a lime-stone subsoil.

On the Poona farm, a plan of raising lucerne has been adopted, which I first observed at Babugarh, near Meerut, and which I can unhesitatingly commend. The seed is sown on ridges which can be made 22 to 26 inches wide by an ordinary native plough.

In practice it will be found necessary to fashion the ridges afterwards into neat proportions with the hand-hoe. The slope of the surface of a field will indicate the direction in which the ridges should be drawn. Irrigation water must flow slowly along each furrow. If the inclination of a furrow is too great, soil and manure are swept to the lower levels of the field by the water gaining too much velocity.

For the seed (which is best sown by hand) a rather deep groove is made with the corner of a light hoe along the top of each ridge; the seed is carefully sown and is carefully covered and should not be buried more than 1½ inch deep The whole operation rounds and flattens the ridges and permits the seedlings to spring up in lines covering a width of 3 or 4 inches; crowding of the seedlings in a dense row is thus avoided. The importance of fine tilth is obvious, because the seeds are small. Frequent light waterings are required during the first fortnight, because the seedlings are delicate. They would probably wither, if exposed on the top of a ridge to a hot wind, unless sufficient moisture was within reach. This plan of sowing effects a saving of seed; 10 lbs per acre is ample In this connection, to avoid loss and waste of time, it is wise to test the germinating potwer of seed to be sown. This can conveniently be done by noting the percentage of seeds that strike when kept in moist flannel for two three days.

One object of sowing lucerne on ridges is to raise the stems of the plant out of contact with irrigation water. Under natural conditions, the plant requires very little surface moisture. Its great root development enables it to collect enough in the subsoil, and therefore when water floods the crop as well as the soil, as in the ordinary bed system, unhealthy conditions are induced, particularly in low-lying places.

The principal object aimed at in adopting the ridge and furrow system is to keep the field clean. The furrows can be weeded each time the crop is cut by using an ordinary bullock hoe or a scuffler. I have found the American "Planet Jr." hoe, which with extra parts costs Rs. 33, obtainable from Messrs. J. Fleming & Co., Bombay—the best possible implement for this purpose. It is

easily worked by two bullocks and can be drawn by a rope or chain attached to an ordinary neck yoke. If fitted with grubber tines in front, and an earthing up double mould board behind, it grubs up weeds, and earths up the ridges at an operation It can be adjusted to any width of furrow over 18 inches If manure is applied in the furrows every second cutting, as it ought to be, it can be, by means of this hoe, incorporated with the soil and placed directly in contact with the roots of the crop Moreover, the furrows are left clean, so that water can flow properly. Four cwt. of bones per acre and fifteen tons of well rotted farm yard manure, applied some months before the seed is sown, is a good preparation. At least five tons per acre of farm yard manure, every second month thereafter with an occasional top dressing of bones, &c., or castor cake, are essential to continuous and increasing vigour of growth. With such treatment, a crop, on suitable land, will be thoroughly established six months after sowing, and yield thereafter 11 to 13 cuttings in a year. The Poona farm crop sown in June, 1891, yielded between that date and the following March, seven cuts. This last cutting, which was the heaviest, came to 6,034 lbs per acre This is equivalent to over 32 tons per acre in a year. This quantity, at the current market rate of 100 lbs per rupee, is worth approximately Rs 717. Crops grown on this system have lasted for six years and over, and there seems no reason to put any term to a crop which is well looked after

If the lucerne crop is saved for seed, this should be done about the middle of the cold weather, water should be sparingly given for a month and withheld as the seed ripens. The object is to prevent a too succulent growth of stems and leaves, to encourage the formation of flowers and seed vessels, and to produce plump seed that has slowly matured.

Arabian grown seed is in some request in India.

The chemistry of lucerne shows it to be of high nutritive value.

Lucerne in flower gives the following analysis :—

Water	74
Albuminoids	4·5
Crude fibre	9·5
Carbo-hydrates	9·4
Ash	2

JAMES MOLLISON,

Superintendent of Farms, Bombay.

Poona, 9th April, 1892.

Wheat Prospects in India for the year.

We have received a number of official papers on this subject some of which are very interesting but we hardly think our readers will care to have them *in extenso*. In the *North Western Provinces* and *Oudh* there are this year 7,335 square miles of country under wheat crop, being a much less area than usual, and a crop of 70 per cent (or more familiarly 11·2 annas) expected. The average price per maund of 82 lbs. is Rs. 2-9-5 or at the ports of Calcutta or Bombay Rs. 3-6-11 per maund. This, we are told, is equivalent to a net profit per maund in London of Rs. 3-7-8. In *Bombay*, the wheat area is reputed to be 4,093 square miles and the crop is expected to be variable, from 12 as. in Gujarat to 10 as. in Sind, 9 in the Deccan District and 2 only in the Karnatic. In the *Central Provinces* the area under wheat is said to be 6,573 square miles and the crop expected to be nearly 10 as. The *Punjab* reports shew the wheat area as 9,724 square miles and the crop as about an average of 12 as. all round. Those from *Berar* show the area as 1386 square miles and the crop about 12 as. Finally, the *Bengal* reports give 1860 square miles and a crop of only 7 as

IV.—REVIEWS.

Annual Forest Administration

Reports of Bengal, Ajmere and the Andamans for 1890-91.

These have only just been received and are so late that we need not refer to them at great length. Of the Bengal Government Review we have long ago (Vol. XVII) given an account, though we had not then the Report itself to hand. Under a new system, all these Reports are kept back in the Press until everybody has had his say and then they are issued. It may be cheaper to the Government and more convenient for the Secretariats who get advance copies, but to outsiders it results in their issue at a time when nearly all interest in what they may contain has ceased.

The most noticeable feature of the *Bengal* Report is the Chapter on Establishment, which shews the results of the attempt to turn Bengali Baboos into useful Forest Subordinates. Of eight Bengalis sent to the Forest School for training in the past seven years, there are now practically only three left in the service, the others having all resigned or remained away on sick leave, while among the rest of the staff, prosecutions have been numerous. There is some reason to think that much of this result is due to the bad prospects held out, and the practice of putting

young Europeans or Eurasians into the Department over the heads of the natives, for we believe that Assam has secured better Bengali Officers by giving better prospects and promotion; but, at the same time, there can be little doubt but that Bengalis are not much more suited for Forest Work than they are for soldiering. Sir Charles Elliot thinks that a remedy may be found in encouraging athletic exercises in schools and colleges, and the Government of India very properly decide not to give up quite yet, but to await the results of improved prospects. We believe that, although of no use as combatants, Bengali gentlemen have done excellent work on frontier and other expeditions where quite as much hardship and malaria are to be met with as in the forests, in the Medical and Commissariat and Transport Departments, and we think that with better promotion and better prospects, better men will come forward and especially those from the Dacca and other Eastern Districts, where likely candidates may more probably be found than in those nearer the Presidency. Mr. E. P. Dansey has set to work with great energy in Bengal and we are sure the sad state of the staff which his report discloses will soon be changed into the efficiency which ought to come under such a Government as that of the Lower Provinces.

In the *Ajmere* Report the only noticeable feature is the strong disapproval which the Government of India have expressed of the policy which the Local Government has lately adopted in respect to grazing and fodder supply. The Ajmere Reserves, about the poorest of the forest areas of Northern India, were taken up, we believe, after considerable trouble, under the advice of Mr. A. O. Hume and Sir D. Brandis; and for a considerable time were very carefully protected, with the result of great improvement in growth, not only of trees but of fodder supply. Lately, as forcibly shewn by Mr. Hill in his special report, much of the good work done has been nullified by a too early re-opening to grazing and hence the remark of the Government of India, strong for them, that *except as regards the treatment of the fodder resources*, they consider the administration satisfactory. As everything in Ajmere depends on the grazing question, the importance of this remark cannot be underrated. We extract the following important expression of opinion from the Government of India Review.

"The time allowed for the cutting of grass within reserves 'was reduced from four months to one month in order to meet the 'expected scarcity of fodder throughout the country by throwing 'the state forests open to grazing. This action has involved a 'change not only of practice, but of policy also.

'From the year of the great famine, 1878-79, it had been the 'aim of the local administration to promote, on Government lands 'at any rate, the cutting of grass, and to reduce grazing within the 'narrowest limits; as the result of this continuous policy, the 'annual outturn of cut grass had steadily increased from 740,000 'bundles in 1884-85 to 1,692,000 bundles in 1889-90.

'This fact was accepted as an indication that the people had 'begun to understand and appreciate the true advantages of a 'conservative treatment of the fodder-resources of the country, and 'some disappointment has therefore been felt that, in the year 'under review, it should have been thought advisable to abandon 'what is held to be the more economical method of reaping a 'grasscrop, in favour of grazing. The circumstance that general 'scarcity of fodder was expected would, if the policy hitherto advo-'cated is sound, have justified a closer exclusion of cattle from the 'reserves, rather than their unrestricted admission while grass fit 'for the sickle was still on the ground. The outturn in cut-grass 'decreased from 1,692,092 to 304,000 bundles, or to 18 per cent. of 'last year's yield.

'It is at the same time admitted that on forest pastures, 'especially where the arbori-vegetation consists to a great extent 'of scrub, there will always be found growing amongst thorns, a 'certain quantity of grass which cannot profitably be removed by 'hand, but will be searched for and grazed out by hungry cattle. 'With this fact in view the Governor General in Council has no 'objection to the proposal made in paragraph 4 of your letter 'No. 1227 S., dated the 13th June 1891, that such reserves should 'be thrown open to grazing in years of marked scarcity, provided 'that such action be not taken until after the removal of such 'fodder as can profitably be cut by hand.

'But His Excellency in Council cannot approve of the sugges-'tion made by Colonel Biddulph, that all reserves, not specially 'selected for the production of timber and fuel, should be thrown 'open annually to grazing, subject only to a limitation of the 'number of cattle admissible to each block. The reserves do not 'appear to be either extensive or productive enough to justify a 'a system of treatment which is held to be the least economical, 'and which would interrupt the progress of a policy which appears 'to the Government of India to be calculated to secure the fullest results."

We should like to hear something about the system of plant-ing which has given such favourable results. It is recorded that "the plants were put down in the ground in earthen pots (or 'gamlas) which protected them against the ravages of wild rats 'and the attacks of white ants, and also gave them the full 'benefit of the water given to them." Planting trees in flower pots and then putting pot and all in the ground is a strange way of raising a forest. What do the roots do when they have filled the pot?

The *Andamans'* Report we have read with much interest, for though it contains very little of sylvicultural interest, there is evidence of a considerable development of the trade in timber from the Islands, which is gradually introducing new woods of value into the Home and Indian markets.

There are three chief markets for the Andamans timber, those of London, Calcutta and Madras. The woods sent to London were chiefly 'padouk' (*Pterocarpus indicus*) in squares and planks and the rate of sale, after allowing for exchange, &c., was apparently, on an average, Rs. 1-12 per cubic foot, but it is noticeable that Woolwich Arsenal took some of the timber at 4s. 6d. To Calcutta, the consignments consisted chiefly of, Padouk', 'Lakuch' (*Artocarpus Lakoocha*), 'Toungpeing-ngè' (*Artocarpus Chaplasha*), 'Thitmin' (*Podocarpus latifolia*), Marble wood (*Diospyros Kurzii*), 'koko' (*Albizzia Lebbek*) and 'Gurjun' (*Dipterocarpus alatus*) and the price received came all round to a little over one rupee per cubic foot. The same result was obtained from the sales in Madras, to which place the same species were sent as well as some 'Pyinma' (*Lagerströmia hypoleuca*), 'Gangow' (*Mesua ferrea*), 'Thingun' (*Hopea odorata*) and 'Chuglam' (*Myristica Irya*), (we hope our identifications are correct—we insert them as it can hardly be expected that our readers at home or in other parts of India, will recognize what is meant by the Andamans names.) The extraction of this timber is carried on by Elephant dragging and a tramway, and its cost has been considerably reduced by the establishment of the latter.

Sylviculturally, the only noticeable matter is the discovery that by opening out the canopy round padouk standards, it is possible to secure a good advance growth.

The Government of India, acting on the recommendations of Mr. Hill's Report, have recommended the immediate commencement of a detailed examination of the padouk forests and the preparation of working plans for their management.

Annual Report of the Khandeish Experimental Farm for 1890-91.

There are only two things in this much reviewed Report which are likely to be of interest to our readers. One is the record that the produce of the 15 acres of Divi-Divi plantations amounted to 3¼ tons which realized Rs 120 per ton in Europe, which Mr. Cappel, the Director of Agriculture, asserts to be equivalent to Rs. 80 per ton *net*. The other is the explanation of the proper method of making a 'stack silo' which we reproduce. The new system appears to have been tried at the suggestion of Mr. Ozanne and Dr. Voelcker.

"To make a stack silo:—Cart the freshly cut grass to a convenient spot and then throw it off on the ground without bed or

'bottom. Spread it and gradually shape it into a four-sided figure. 'The heap shou.d be laid out 3 feet wider than is required, and 'trimmed back afterwards. Then when the heap is three or four 'feet high, walk two buffaloes or bullocks on its top round and 'round. Stacking should be done gradually, so that the mass may 'get time to heat. I have taken buffaloes on to the stack when it 'was over eight feet in height by making a slope of the green stuff. 'The bullocks may be kept on the stack at night, or, if removed, 'the stack should be weighted to press it down. When the required 'height is attained, the trimmings should be laid on to the top, 'thick branches of trees put on, and weighted with stones 2 feet 'deep. Stones should be of the size of a fist to a man's head. 'Stones of larger size require more labour in loading and 'unloading"

We can find nothing in the report to shew whereabouts exactly this farm is, though we gather that it is rather inaccessible. It is a pity that professional work like this could not have been reviewed by a professional, instead of by a series of more or less amateur civilians.

The Scrub Exterminator.

We have received one or two reports on experiments made on prickly pear with a mixture going under the above name, which has for some time been recommended as a convenient and efficient agent for destroying Scrub. The Mysore Gazette of the 11th February last, contains an account of several experiments conducted there under the supervision of the Inspector-General of Forests, Mysore; these appear to show that the Exterminator was more or less of a failure, the Prickly Pear stems operated on, though more or less dried up, retaining sufficient vitality to shoot up again and apparently requiring to be at once either buried or burnt after the application of the solution, to secure complete extermination. In the above experiments, solutions of different concentrations were used, varying from about 1 lb. of the chemical to ½ a gallon of water to 1 lb. to 6 gallons of water. The price of the chemical alone, exclusive of the cost of pump, labour, &c., required for its diffusion, is about Rs. 60 per 100 lbs.

Several experiments have also been carried out in Madras, all of which tended to show that the Scrub Exterminator does not possess any material advantages over the ordinary methods of eradicating prickly pear and other plants, whilst it is more expensive; moreover the mixture is dangerous to use on account of its poisonous character, containing, as it does, arsenic, sulphur, alkali and alkaline salts. The solutions used in these experiments

varied from about 1 to 6 to 1 to 20, and the results, in most cases, showed that the effect of the chemical was only temporary, though in one experiment, a solution of 1 lb. in 20 gallons of water is reported to have been sufficient for destroying young clumps of prickly-pear. We notice that in the advertisement of the article, it is said to have been very successfully used to kill off pipal and banyan trees that had taken root in the walls of the buildings at the late King of Oudh's Palace in Garden Reach. If this is really the case, it ought to be very valuable, for we know of no other satisfactory means of getting rid of those terrible enemies of brick-work in this country.

V.—SHIKAR.

The Dehra Dun Fishing Association.

We have received from the Honorary Secretary a report for the year ending 31st December 1891; it contains Extracts from the earlier proceedings of the Association, and a clear exposé of the aims and objects of the members. With these we can thoroughly sympathize, and we trust that the endeavours of the Committee in urging on Government the necessity of legislation on the subject will be crowned with success.

At present the only waters which are preserved, are those in the Eastern Dún which are under Forest Rules; the other day a member of the association caught an 18 lb. Mahseer in these waters, an event which would be impossible at this time of the year in any other part of the Dún—this shews the good of preservation.

We understand that it is the intention of the Association to endeavour to introduce trout from England into one of the forest streams in the Eastern Dún, and we cordially wish them success. We shall watch this experiment with great interest.

VI.—EXTRACTS AND NOTES.

The Oak.

We see that Professor H. Marshall-Ward has just published a new and interesting book on the Oak, which is a short but complete account of the anatomy and physiology of the Oak as a forest tree from the earliest stage of its development from the acorn, through that of the seedling and sapling to the mature tree. Eight chapters are devoted to the description of the different organs and the growth, distribution and structure of the tissues in the various stages of development, including a somewhat complicated one on the course of the fibro-vascular bundles from the leaf to the stem. One chapter is devoted to a description of the timber of the Oak, its structure and technological peculiarities, one to the cultivation of the tree and the diseases and injuries to which it is subject, and a short concluding chapter gives the relationship of the Oaks and their distribution in space and time. The book contains numerous and excellent figures illustrative of the subject, which, however, lose some of their value from the reference letters being in many cases printed so small as to be illegible. Otherwise the book is extremely well got up and should prove of use to any one who is interested in forest botany. We are, however, a little inclined to doubt whether the treatise can be appropriately termed "a popular introduction to forest botany" as is set forth on the title page, as much of the subject matter would, we think, require a not inconsiderable previous knowledge of botany to be thoroughly understood and appreciated.

Goats in the Bombay Presidency.

One of the things not generally known is that in four Deccan Collectorates—Poona, Nasik, Ahmednagar, and Sholapur—there are six hundred thousand goats, whose purpose is to supply the Bombay public with a large proportion of the "mutton" which it buys in the markets. A contemporary draws attention to the injury to agriculture which must inevitably follow from a plague of goats in the Deccan with its poor soil and scanty rainfall, the population of which is always a source of special anxiety to the Government. Goats are the most destructive of animals

where they abound all vegetation quickly disappears. They destroy any bush, and suffer no tree, no plant, to grow. They are not grass eaters, but in the dry season they nibble away the roots and destroy the pasture of the coming year. The desolation of the land around Aden is not wholly due to the want of rain; there are many gorges in which trees and bushes would grow were it not for the goats, which make short work of every twig. In Algiers, the goat pest proved so destructive that the administration issued an order that all in the affected districts should be tied up. The enforcement of this regulation had the desired effect, and the fertility of the territory, which was was relapsing into desert, has been saved. St. Helena is rapidly becoming a mere rock, the woods which once clothed the hill-sides having for the most part disappeared. The changed conditions which are threatening the scanty population with ruin and extinction, date from the introduction of goats into the island. Any country overrun by goats will soon be in as hopeless a condition as the Australian pasturages which have been destroyed by the plague of rabbits.—(*Indian Agriculturist.*)

Match Manufacture in Japan

Of all the industries which Japan has borrowed from abroad, that of match making has been the most successful. The first match factory was established in 1876, and by 1880 the demand for the foreign article had considerably declined, while Japanese matches were exported to the value of £58,532. There was a decline during the next few years, but in 1886 the industry recovered itself, and the export of matches in that year amounted to £63,000. Since then the trade has steadily increased, and though prices had considerably fallen meanwhile, the export in 1890 was worth nearly £236,000. The export trade is chiefly to Hong Kong (80 per cent.) and the Chinese Empire (17 per cent) It is almost entirely in the hands of Chinese merchants, who place orders with the makers and arrange labels for the boxes. The operatives employed belong, as a rule, to a very poor class. The men are paid from 2d. to 7d., and the women from 1½d. to 4½d per day.—(*Timber Trades Journal.*)

We wonder that this industry has never yet been seriously taken up in India. It cannot be the wood that is wanting, for Himalayan fir wood can be delivered in the plains at 8 as. per cubic foot, or less. It must be the difficulty of getting the sulphur or the phosphorus or both.

HON. ED.

The Preservation of Logs.

A new method of impregnating logs with zinc chloride, in order to preserve them, is now in use in Austria, being known as the Pfister process. The timber is impregnated in the forest as soon as possible after it is felled. The zinc chloride solution has a specific gravity of 1·01 and is forced into the thick end of the log by a force pump. To this end, an iron disc of suitable diameter and furnished with a cutting rim is forced into the end of the log and secured by clamps. The time required for this preliminary work is three or four minutes for each log. After a pressure of two or three atmospheres has been maintained at the thick end of the log for a few minutes, the sap begins to exude at the opposite end and finally a weak solution of zinc chloride comes through, showing that the operation has been completed. About 2 ¼ gallons of the solution are required per cubic foot of timber treated. Though rapid, the process does not appear to distribute the solution so uniformly as other methods.—*(Ibid.)*.

The Influence of Forests on Water Supply.

Does cultivation and protection of forests cause an increase in rainfall? The reply of Mr. Henry Gannett, as published in *Science*, does not tend to confirm the generally admitted opinion on this question: whilst the statistics collected by this scientist have the more value, in that they refer to extended tracts in which the conditions of the country and the climate, both before and after changes in cultural treatment, are perfectly well known.

His observations extend over—

I.—An area of prairie lands in the State of Iowa in the north of Missouri, in the south of Minnesota, Illinois, and partly in Indiana. This area, measuring about 163,000 square miles, was formerly entirely covered with grass, but during the last 30 years large portions of it have been afforested.

II.—The State of Ohio, with an area of about 58,000 square miles, formerly entirely covered with forests, of which at the present not one-tenth exists.

III.—An area of about 18,400 square miles situated in Massachussetts, Rhode Island, and Connecticut, which was densely wooded before its colonisation by Europeans. After the almost total destruction of these forests, about one-half of the area has, since 1860, been re-afforested.

If the removal of forests produces a decrease, and afforestation an increase in the rainfall, the result of observations extending over a long series of years should show in the first instance

an increase in the rainfall, in the second a decrease, and in the third a decrease up to 1860, and an increase after that date.

But the statistics collected by Mr. Gannett show that in these prairie lands an increase in the area under forest has not only not been followed by an increase in rainfall, but by an appreciable decrease. In the second instance, that of Ohio, a decrease in rainfall has indeed been proved, but this decrease is so insignificant that it cannot be seriously advanced as a conclusive proof of the unfavorable effect of disafforestation. The results of statistics collected in the third instance, that of Massachusetts, also do not tend to confirm in any way the generally accepted theory, for up to 1860 it is shown that there was an evident increase in the rainfall over this area, reaching a maximum of 2·8 inches annually.

Mr. Gannett also investigated the question as to whether the cultivation of land denuded of forest growth resulted in influencing the rainfall; but the result of these investigations proved that no increase or decrease had occurred.

In writing generally on the causes of atmospheric phenomena, we have replied to the often put question which forms the title of this article long before Mr. Gannett wrote on the subject. In this periodical some six years ago we said "that forests do not 'produce rain, but that they play the important part of storing 'it up."

As far as concerns Algeria, we have arranged the observations registered at various meteorological stations in the provinces of Oran and Constantine, and these observations, extending over a period of 25 years, refer to large areas covered with forest, adjacent to others which are entirely free from forest growth; and whilst the areas are not to be compared with those reported on by Mr. Gannett, yet the results of the observations are very conclusive.

The region where the rainfall observations have most interest for the Forester, is bounded on the north, between Bougri and Lalalle, by the Mediterranean, on the east and west by the valleys of Summam and Sezbouse, and on the south by the high plateaux forming the water-shed between the sea coast and the desert of Sahara. This tract is in area about 47,000 square miles; and though no regular re-afforestation works are being carried out, yet the c[illegible]ure of large extents of forest and pasture land against the destr[illegible]ive action of the natives may almost be regarded as having [illegible]similar effect.

In spite, howeve[illegible]f these protective measures, many thousands of acres hav[illegible]rom 1850 to 1875 been burnt over, and it is especially in [illegible]se burnt areas, when compared with others successfully protected, that the rainfall statistics have the greatest significance.

These statistics show the following results :—

I.—That nearly the same amount of rain fell annually before and after removal of forest growth, and before and after re-afforestation.

II.—That totally different effects are produced by the annual rainfall before and after removal of forest growth, and before and after re-afforestation.

During the summer following the removal of forest growth the spring-level begins to fall, and the following year most of the springs dry up.

In consequence, the water-courses cease to be permanent and become intermittent, being transformed, during actual rainfall, into impetuous torrents, which cease to flow during dry weather.

The valley of Oned-Guebli to the north of the province of Constantine, furnishes a remarkable instance of this.

This immense valley is divided into two portions by the river of the same name, and the western side includes the densest forests of this region, whilst the eastern is almost entirely denuded.

During eight years of topographical research in these mountains, we have invariably remarked that during the winter, when heavy rain falls persistently, often for weeks at a time, the floods in the water courses from the Western or wooded side rise slowly, and rarely overflow the banks, and even after tropical rain storms, which are frequent, the water remains clear.

On the eastern or denuded side, however, this is not the case. Scarcely has the rain commenced, when each small ravine becomes a torrent, which rolls down gravel, boulders and rocks, and overwhelms the neighbouring fields: whilst the muddy water passes rapidly on, arrested by no vegetation, conferring no benefit on the country it traverses,—to leave behind, on the cessation of rain, nothing but dry and rocky ravines.

There is, however, no need to expatiate on the disastrous action of rain in mountains and unwooded countries, it being too well-known.

At the same time, well-informed people have frequently an exaggerated idea of the value of mountain forests, attributing to them other virtues than those which they possess. The virtues they do possess are the power of storing up the rainfall, and thereby regulating the flow of water-courses and springs, and they are entitled to respect.

Our rainfall observations are extremely interesting in reference to forests which have been destroyed by fire; in such forests, the annual rainfall remaining unchanged the springs dry up and the water-courses become dry ravines.

We need not be content with contemporaneous evidence; we can also bring valuable witness from the past to the truth of our assertions. About 10 miles to the west of the road from Constantine to Batna there is a horse-shoe shaped mountain range, with its convex towards the east. This range is named Djebel Anouda by the natives of the country. The inner slopes of this horseshoe were formerly thickly wooded; a fact proved by the

presence of stumps of oak trees. These stumps, deeply charred and rooted in soil thoroughly baked by the fire which destroyed the trees themselves, have hitherto resisted the decomposing effects of time. An enumeration of the stumps shows former growth of about 60 large trees per acre, and in the centre of this magnificent forest there are the remains, in hewn stone, of a gigantic tank, and issuing therefrom a broad aqueduct, traceable in its ruins for several miles. To-day the soil of Djebel Anouda is one of the most arid in Algeria; in former days, a strong spring existed, its water-supply stored and protected by a sturdy forest growth.

In concluding this short paper, we would like to add that, though the extent of the areas under our notice cannot compare with those observed by Mr. Gannett, on the other hand our rainfall stations are much closer to each other than those under Mr. Gannett's registration. Of 44 such stations erected by the Government of Algeria, the four which enclose the tract of Oued-Guebli have been most useful to us. It is this tract of country that the observations above recorded refer to, and these observations lead us to the conclusion that "the salutary influence 'of forests in storing atmospheric humidity is irrefutable; but to 'enable them to store this humidity, the atmosphere must first 'contain it.—L. PARQUET, in *Révue des Eaux et Forêts.*"

Alaskan Forests.

The whole of the south-eastern portion of Alaska lying westerly of the coast-range of mountains is a dense forest.

One of the peculiarities of Alaska forest scenery that first impresses the observer, is the lack of variety which it presents. The whole forest area is composed of less than half-a-dozen species, and these, for the most part, are evergreen trees. The Hemlock, White Spruce, and Arbor-vitæ are the most prevalent—so prevalent that few would perceive there were anything else. The Hemlock Spruce to the common eye, would appear to be the same as our eastern species, *Abies canadensis*, but the botanist notices a distinction, and names it *Abies Mertensiana.*

English botanists endeavour to honour their Prince Albert in the same way, and in some of the catalogues of Pacific trees it figures as *Abies Albertiana.* The White Spruce, though resembling the Eastern, is also distinct, and called *Abies Sitchensis*, because the Russian botanist who first named it found the trees in the vicinity of the Russian settlement, Sitka. The Arbor-vitæ is there called Cedar, and is again different from the Arbor-vitæ of our Eastern States (*Thuja occidentalis*), by its paler green tint, and by the enormous size to which it grows. On this account, botanists

have named it *Thuja gigantea* (*Lobbii* of English gardens). The Douglas Spruce is found here and there, as is also the twisted Pine, *Pinus contorta*. There are said to be others here and there which I did not see. In a general way, we may say that the three first named make up the forests of Alaska. Among the deciduous trees the Oregon Birch (*Betula oregona*) and Alder (*Alnus viridis*), make fine trees, and often form dense woods on river bottoms, or along the wake of receding glaciers. Then there are a few strong-growing Willows, and these together make up practically the arborescent growth of Alaska. Now and then on the high ridges would be a solitary specimen of the Canoe Birch, Red Maple, and Elder-leaved Mountain Ash, indicating that east of the mountain ridge they might be found in quantity; and among the driftwood along streams, trunks of *Populus canadensis*, one of the Cottonwoods, would occasionally be seen, so that somewhere they may be found in some numbers.

Unfortunately, in the matter of timber, the Alaskan forests, as far as I saw them, are of little value. The trees grow so thickly together that, so far as the soil is concerned, they starve one another, and good logs would be very rare indeed. One can scarcely imagine from usual forest experience how closely these trees are packed together. I and my wife undertook to walk 4 miles by an Indian trail through one of those woods to a point where we might head off our vessel. So thick was the mass of vegetation on each side of us, the path being wide enough for one of us at a time to travel single file only, that we could not have seen a bear 10 feet away from us, and only for the rifle carried by the good Presbyterian missionary who piloted us, we would not have trusted ourselves amidst the jungle of foliage which made up these Alaskan forests.

One reason for the dense covering of the land with trees is the favourable conditions for seed germination and the apparent scarcity of seed-eating creatures. The warm temperature given off by the sea of Japan, which comes up south-westerly to break against the Alaska shores, meets the snowy-cold of the mountain peaks, condensing the moisture, so that the surface of ground—or, indeed, anything else—is never absolutely dry, and every seed that falls to the earth has a chance to sprout and grow.

Totems.

In the old Indian village were White Spruces, 20 feet high, growing out of the top of totem poles. These poles are themselves 30 or 40 feet high, and seem to have been selected from the largest trees. They are stripped of their bark, and have carved on them series of likenesses of creatures, real and imaginary, representing the genealogical descent of members of the tribe. It was a curious sight to see the White Spruces, like huge Christmas trees, growing from the flat tops of these poles. In some cases the roots from these living trees had split the poles in their descent to the earth,

into which the roots had, in some cases, so thoroughly penetrated, that, should the poles finally rot away, the trees would probably on these stilts of roots continue to grow on as trees high up in the atmosphere. Nothing but a climate continually saturated with moisture would permit of a seed sprouting, and the tree continuing to grow out of the top of a pole in this manner.—*(Gardener's Chronicle).*

VII.—TIMBER AND PRODUCE TRADE.

The Teak Market in the 1st Quarter of 1892.

Messrs. Denny, Mott, & Dickson report deliveries from the docks in London last month 1,838 loads; as against 1,666 for the corresponding month of last year.

The first three months of the year show:—Landed, 3,777 loads of teak in London Docks, as against 4,961 loads during the same period of last year; deliveries, 2,787 loads (of which only 623 loads Bangkok), delivered from the docks, as against 4,389 loads delivered during the same period of last year. The landed stocks in the docks show:—8,000 loads of logs, against 7,294 loads same period last year; 2,560 loads of planks, against 1,630 loads last year; 106 loads of blocks, against 36 loads last year.

The above figures exhibit a falling off of some 36 per cent. in the deliveries, and of some 24 per cent. in the supplies, as compared with the corresponding three months of last year; and however the shipments from Burmah and Siam may continue to fall off this year, through the scarcity of wood at the shipping ports, the stocks on this side will suffice to meet the present rate of demand for some time to come.

The almost entire suspension of foreign rolling-stock orders continues to stop our English railway coachbuilders from coming into the market for teak; whilst the demand for shipbuilding purposes has been weak, as is generally the case in the early months of the year.

On the whole, the conjunction of a bad demand with an undeniably short forward supply, seems to promise a quiet market with little room for any great fluctuation in price, provided shippers continue to recognise the fact that there is sufficient good timber on this side to leave them no excuse to attempt to

supplement their short shipments of good wood by those of indifferent quality; as whilst it is always a mistake to press inferior teak on the European market, it is peculiarly so when consumption is falling away, and buyers consequently becoming increasingly fastidious as to quality and specification.

Messrs. Hoar & Brown report as follows:—

TEAK—	Timber. Loads.	Planks. Loads.	Blocks. Loads.	Total Loads.
Stock, 1st March Landing ...	8,810	2,587	103	11,500
Ditto ditto ...	22	229	3	254
	8,832	2,816	106	11,754
Deliveries	832	256	nil	1,088
Stock, 31st March	8,000	2,560	106	10,666

Deliveries for the quarter ending		Timber. Loads.	Planks. Loads.
31st March	1892	1,954	812
Ditto, ditto ...	1891	3,590	869
Ditto, ditto ...	1890	2,786	784

It will be observed that although the stock is somewhat reduced, the deliveries for the quarter compare very unfavourably with the same period of 1890 and 1891, showing that the demand still remains unsatisfactory. Now that the Admiralty have made their arrangements for the year's supplies, the market will no doubt assume a decisive tone and settle down more firmly without a recurrence of the fluctuations that have lately taken place. Although other business has been very quiet, the position points towards a firm market, and with short forward supplies, prices ought gradually to improve towards the summer months. The docks are still well stocked for present requirements, the timber being mostly of exceptionally good character, as nearly all the inferior shipments are now cleared away. Bangkok stocks are being offered broadcast at very low figures, and although the cargoes lately imported are of superior quality and condition to those of former times, yet they appear to command very little attention. The plank market continues dull and stocks excessive.—*(Timber Trades Journal).*

Churchill and Sim's Circular.

June, 4th 1892.

EAST INDIA TEAK.—The deliveries for the first five months of the year have been 4,269 loads, against 6,568 in 1891 and 6,409 in 1890, and for the month of May in the same years 901, 1,208, and 2,105 loads respectively. It will therefore be seen that a very material reduction has taken place in the trade in this wood in London, while seeing that the dock stocks are fully equal to the average, and that prices are moderate, is a very unsatisfactory position to explain. It can be accounted for only by general stagnation in ship-building as in other trades, and the fact that stock in this market has become relatively dearer than at other ports.

Rosewood—East India. There is a fair demand though prices are a little easier.

Ebony—East India. The demand remains very dull.

Price Current.

Indian Teak	per load	£9-10	to £15
Cedar, Malabar	„ sup ft.	3d.	to 3½d.
Satinwood, East India	„ ton	£7	to £12
Rosewood „ „	„ „	£7	to £11
Ebony „ „	„ „	£8	to £10

MARKET RATES FOR PRODUCTS.

Tropical Agriculturist, 1st June, 1892.

Cutch	per cwt	24s.	to 34s.
Croton seeds	„	15s.	to 20s.
Gum Kino	„	70s.	to 72s. 6d.
India Rubber, Assam	per lb.	1s. 6d.	to 2s. 2d.
„ Rangoon	„	1s. 8d.	to 1s. 10d.
Myrabolams, Bombay	per cwt	9s. 3d.	to 10s. 6d.
„ Jabbulpore	„	8s. 6d.	to 9s.
„ Godavari	„	9s. 3d.	to 10s. 3d.
Nux Vomica, good	„	9s.	to 10s. 6d.
Orchella „	„	20s.	to 25s.
Red wood	per ton	£3.	to £3-10s.
Sandal wood, logs	„	£35	to £60
„ chips	„	£9	to £30
Sapan wood	„	£4	to £7

The seedlings should be ready for planting in the months of November and December, that is, in the beginning of the rains, procured either from the forests or from nurseries. The production of seedlings is assisted by setting fire, in the months of July and August, to the forests. The fallen seeds by this means get a good roasting whereby their germinating power is facilitated.

The heat chars the outer corky covering of the seed and the outer skin of the kernel is opened, thus causing a speedy germination.

The setting fire to the forests in the east monsoon solely for the above purpose, is seldom necessary, as they are usually set on fire at that time of the year by the neighbouring population.

In extraordinarily wet years the firing of the forests during the east monsoon becomes impossible, when it is advisable to collect large quantities of seed, to roast them and then to throw them broadcast over the ground in the forests.

The above described method of planting is simple and entails the least expense.

With regard to the favorable results obtained in Tegal and Pekalongan and since 1882 in Samarong, I have, in overworked forests, also in land near forests, not made use of any nurseries. Nevertheless, in some instances where cultivation was, as regards ruined lands, far from any forests, nurseries were necessary.

In such cases, the first thing is to procure good seed. Large and sound seed which, having well ripened on the tree, falls of itself, should be chosen.

The collection should take place in July and August. About September the seed should be put down near the ground intended for the nursery and covered up with a layer about ½ a foot in thickness of *alang-alang* grass. This should be set on fire and when the grass is burnt out, to prevent the seed being entirely consumed, the mass should be stirred about till the ashes are cold.

The charred seed should then be wetted, and while wet, planted out in rows at a distance from seed to seed of 1½ hands and put in to a depth of 3 inches.

The ground intended for the beds should be well dug up and worked to at least 1½ feet in depth, and water daily poured briskly over it.

The plants begin to germinate from 4 to 6 weeks after sowing, and at the beginning of the rains are of a sufficient height for transplanting. The covering of the beds is not required longer than until such time as the seed germinates, when the young plant needs the warmth of the sun.

When the time to transplant the seedlings arrives the young plants are taken up, by the cultivators, with a clod of earth attached to them, out of the forests or nurseries, conveyed to their destined places and there examined one by one by an experienced hand. It has been found that very young seedlings thrive better than older ones, thus seedlings with soft herbaceous stems and

some four small leaves answer best. On the other hand seedlings with hard woody stems do not do at all well, always remaining stunted and a large percentage of them dying.

In removing the seedlings from the nurseries, care should be taken that their hair-like roots are not injured. Transplanting into the rows should not take place before 4 P. M. so that the young plants shall have the benefit of the rain, which usually falls in the evening, at once.

THE SPACING OF THE PLANTS.

With regard to the breadth of the rows in which the seedlings have to be put down, their distance from each other is determined by a consideration of the situation and quality of the ground and the strength of the seedlings procurable. When the ground is dry and of poor quality, it is advisable to cover it up as soon as possible from exposure by close planting. When the soil is rich, broad planting is advisable. The principle to work on is so to cultivate and work the ground that the plantation may be completed and closed in as short a time as possible.

As I remarked before, everything should be done to suppress the luxurious undergrowth in this tropical country by covering the ground in as short a time as possible. The rows between the teak, whether made broad or narrow, will not be of much use in this. The only efficient course is to constantly keep clearing the ground and to do this in the least expensive way. The planting of fruit trees as done by the contractors, serves this purpose.

In order to determine the distance between the rows, whether or not a sufficient number of contractors can be procured to work the plantation on the plan described above, is the first consideration.

It is generally understood that planters prefer the broad lines to the narrow ones and in this respect the interest of the planters and that of teak cultivation is the same! and therefore, it is a first condition that the distance between plants will not be so great as between the separate rows.

In the first year, attention has to be paid to the growth in height of the young trees and by close planting and constant working of the ground this can be obtained.

During the second year, the development of the branches begins, and in consequence of the closing up of the young forest, field labor in the plantation becomes impossible.

The space between the rows must be broad enough to allow the cultivators room for one year's cultivation, without their produce being interfered with or suppresed by the teak. The least room between the rows that can be allowed is 3 metres. Should this space be curtailed, there is danger of the cultivators removing the leaves of the young teak plants so as to admit light and air to the trees and vegetables they themselves are cultivating. This would, of course, interfere with the growth of the teak and to

prevent the practice, not only should the plantation be well watched, but sufficient room should be allowed the cultivators.

The spacing most recommended for planting teak is 1 by 3 metres that is, 1 metre between the plants, and 3 metres between the rows. In unfavourable soil, the space between the plants should be increased from 1½ to 3 metres.

In the districts of Tegal and Pakalongan, I used various spacings; the 1 by 3 metres giving the best results.

No notice was taken of the Government order prescribing a spacing of 4 by 4 metres. Plantations made with this spacing are not easily completed and closed for as soon as they are left to themselves, the ground gets covered by *alang-alang* grass which catching fire and burning in the dry season, utterly destroys the young plants.

THE CHOICE OF CROPS.

It is understood that this connection between agriculture and forest conservancy has in view the attainment of a regular and cheap working of the land.

In the choice of the crops, attention should be paid to those which are most useful and afford most support to man.

Again, attention has also to be directed to the quality of the soil.

For the first sowing, between the rows, maize (djagoong) is recommended. It is sown immediately after the teak plants are in the ground. Following the maize, tobacco is put down, the time for which falls in February, and again in September.

The question however is that, considering the limited consumption of tobacco in the market, its importation from Europe and consequent easy procurability, will its cultivation on a grand scale be possible?

Tobacco to grow well requires a good soil, it cannot therefore be made use of in teak plantations made on poor soil. In the latter, the Ketella pohon *(Jatropha manihot)* is strongly recommended.

This plant thrives well in poor soils and has the advantage over others of spreading and affording shelter to the ground, while on harvesting, it necessitates some labour, as the roots have to be extracted and the ground thus thoroughly broken up. The Ketella has a tendency to form strong roots as well as a luxuriant leaf growth, which latter, indeed, if not seen to, will speedily interfere with the growth of the teak. For the latter reason, it is not advisable to plant the Ketella too close to the teak.

The Lombox and Teron are plants also recommended for planting in the rows. Both these plants thrive well in ordinary good soil and, with constant working of the ground, a good harvest is certain. Also the Katjang-tjina (*Arachis hypogœa*) is strongly recommended. It keeps weeds and all other undergrowth well down by its luxuriant leaf growth.

The Katjang should also be planted not too close to the teak, else there will be danger of its interference with the growth of the same. This plant, like the Ketella, has to have the ground well broken up for the removal of its fruits.

In conclusion, mention is made here of the Djarak *(Ricinus communis)*. This plant is much cultivated by the natives owing to the fact of its requiring very little attention.

It is not, therefore, recommended for cultivation between the rows of teak.

Instruction in Forestry at Coopers Hill.

After reading, in the March number of the *Indian Forester*, the Editor's paper on the advantage of practical work in forestry education, I regretted that distance compelled me to allow several numbers to appear, before I could remove the impression it conveys to readers of the *Indian Forester*, that practical training is not amply afforded to the forest students at Coopers Hill.

The object of my previous paper *was to explain why a term of preliminary practical work in Germany is not necessary for our students before the commencement of their course at Coopers Hill, and Mr. Gamble agrees in this, but thinks I wish to reduce practice to mere tours in the forests, all crowded into our third year; he also assumes the possibility of our men coming out to India, "*stuffed with theory, but incapable of replanting a bare hill-side, or of thinning an overcrowded compartment.*" He wishes them "*to learn practically how to thin forests, to make nurseries, to plant, prune and tend trees,*" which can, as he says, be very well done in England, but he is afraid that such absolutely necessary instruction is neglected at Coopers Hill.

It is unaccountable how he failed to notice my statement; "*that every forest school should have an area available where practical instruction may be afforded in planting, sowing, thinning and other silvicultural operations, also in measuring trees and in estimating the contents of woods.*" Why should we pay £300 a year for 800 acres of forest, if we don't set our students to work there, as well as in our large forest nursery within the College grounds?

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*Indian Forester, Vol. XVIII, January No, p. 12.

During our first year's course, exclusive of botanical excursions, one afternoon every week in the October and Lent terms, is devoted to out-door forest works; observation of the mode of growth of trees in Windsor forest, or, in its proper season, nursery work or planting, in which every first year's student takes his share: during the summer term, besides the above operations, one whole day every week is employed in fire conservancy, or in making thinnings in our own forests or in visiting the neighbouring forests of High Wickham, Esher, Epping, &c, during the fellings, when they are most interesting to study.

Mr. Gamble, curiously enough, assumes that our students only visit the forests I have described, in their third year, when there would be danger of showing them too much at once, though I distinctly stated that they see the Normandy forests in their first year, while our second year's men work in the Windsor forest at thinning compartments of Scotch pine, and at forest estimation, description of compartments and preparing working plans. They will also visit the New Forest, or the forest of Dean at the end of their second year. Our third year's men visit the German forests with Sir Dietrich Brandis, principally to see applications, on a large scale, of their training at Coopers Hill; they also prepare a working plan in a selected German forest besides working with their own hands in the Schwartzwald, at thinnings, charcoal making and sliding timber down hill-sides with ropes and levers, and at other forest operations.

How then, can Mr. Gamble have imgained that our men spent their first two years in theoretical studies, and only enter the forests in their third year, and that we show them too much at once, and do not ground them in practical work. My contention is for practical work and instruction work *pari passu* with theoretical instruction, and with a professor at hand to explain matters.

The necessity for such a method of instruction was soon discovered at Dehra Dun; before 1885, the Deputy Director of that school was in charge of a forest division and only taught during the rainy season, and the students were distributed amongst the forest divisions of the N W-Provinces and Oudh to learn practical work. As a necessary consequence, the divisional officers set them to do whatever was most urgent at the time, and they had little leisure to explain matters to the students, so that the latter kept on doing the same thing over and over again, and made little progress in a general knowledge of forestry. In fact, under this method, for them to see everything of interest in the forests of the Province, much more time would have been required than the 12 months available in two working seasons. Dr. Schlich then found it necessary to set free the Deputy Director and Instructor at the School from all executive forest work, so as to enable them to teach silviculture, and road making, &c, in the forest. Is it likely that he would now wish the Coopers Hill students to learn forestry merely in the class-room?

Mr. Gamble refers to certain obsolete methods of instruction or medical and engineering students, in which they learned

practice first, and theory afterwards. This has been entirely abandoned for the medical profession as the *practical* doctors killed off too many of their patients. As regards engineering, the famous French *Ecole Polytechnique*, the Royal Naval College at Greenwich, as well as the Royal Engineering College at Coopers Hill, are all highly successful instances of scientific education combined with technical training. Numbers of men from all these colleges, besides holding most important posts under Government, have accepted lucrative appointments and partnerships in private engineering firms, which shows how highly such a training is esteemed now-a-days. George Stevenson and Brunel succeeded without good theoretical training, because they had immensely strong intellects, and were without competitors of any great calibre, and they paid for the best mathematical ability available to work out their calculations, which they could not do themselves. Times have changed, and any one now following such a plan would waste his strength on drudgery, and hardly ever rise to any eminence.

A good scientific education is also now essential for forest officers, and with the greatest possible respect for Scotch* foresters who have been tried in India, and for Mr. Thiselton Dyer's gardeners, I contend that our *corps d'élite* of the Indian Imperial Forest Service should be trained on a different plan to the rough and ready practical one ; if, as Mr. Gamble says, "*much of the best work of the Forest Department in India has been done by men who have never heard a theoretical lecture nor entered a German Forest,*" why does he not persuade Government to put an end to the forestry instruction at Coopers Hill and Dehra Doon, and go back to the more economical state of things which existed thirty years ago ? The fact is, however, that a want of proper initial theoretical training can rarely be supplemented afterwards by study, as the work of administering the forests of India generally makes too great demands on the time of forest officers, and such training is best absorbed by the young, and not by men who have spent years of their life at routine work.

During my visit to the Nancy Forest School, last December, the Director expressed surprise and regret that so little has been done in the way of original papers on Indian forestry, by the Englishmen, who were trained at Nancy for twenty years. This, I believe to be chiefly due to want of leisure, but some of our clever men may also think it wiser to reserve their energies for the routine of administrative work. Our countrymen are only too ready to take to the practical side of things, and to neglect scientific research, and the spur of the Editor of the *Indian Forester* might be used with advantage to counteract this tendency, not to confirm it.

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*The canny Scotch finding that mere practice is not sufficient, have now got a Professor of Forestry to teach them.

Mr. Gamble speaks of *balivage*, *estimation*, *recolement*, and surveying *coupes*, as the extent of the practical work he did at Haguenau. Do all readers of the *Indian Forester* understand these terms? They mean marking trees for felling, estimating their volume, and counting up the stumps of felled trees; whilst surveying a *coupe*, or felling, does not differ materially from surveying any other area. There is a good deal of monotony about *balivage*, *estimation* and *recolement*, when steadily followed nearly every day for eight months in the forests of a single district. Mr. Gamble does not say a word about making nurseries, planting, pruning and tending trees at Haguenau. I was not made to do any of those latter operations there, and got heartily sick of *balivage* and *recolement*, when the war of 1870 curtailed our stay at Haguenau by two out of the intended eight months. Monsieur Clement de Grandré, of whose instruction Mr. Gamble speaks so highly and with whom I lived, and who was a most excellent and indefatigable forester, was taught at Nancy, on the plan of theory first and practice afterwards, and I wonder how many of Mr. Gamble's fellow students who joined Nancy fresh from the Lycées, have turned out bad foresters, owing to the supposed *vicious* system of instruction they were subjected to. The French Government has now even gone further than formerly in theoretical instruction, no student comes to Nancy without having first passed through a two year's course at the *Ecole Agronomique*, and competed successfully against about 200 students of that school for admission to Nancy, as a state forest student. As for the bias in favour of any particular system, if men are first taught by practical foresters, instead of by professors, I maintain that no comparison of systems is necessary to induce such bias; it is sufficient that a student finds a hardworking, intelligent forest officer carrying out a particular system, with excellent results, for him to wish to apply the system elsewhere, even under circumstances where it is not applicable. The French state forester's rage for converting coppice with standards into high forest, and against the selection system, artificial planting and low rotations with a view to high interest on capital, have prejudiced many an Indian Forest Officer against systems which give excellent results in certain European localities and are frequently applicable in India.

Sir Dietrich Brandis has kindly written to me about my paper from a different point of view to Mr. Gamble's. He writes, "*As for German students, I prefer the Prussian system, but as regards English students, the case is much stronger, not a single German student, who takes to forestry at Giessen, Tubingen, Karlsruhe, &c., is ignorant of the great essential features of forest management. With them, forestry is a matter of course, they believe in the necessity of methodical forest management, because they have been accustomed to it all their life. English lads will not take kindly to forestry, as a profession, unless*

they have realised what forest management on a large scale is." Now that our students go regularly in their first year to the Norman forests, there can be no doubt that they do appreciate forestry on a large scale and the knowledge they acquire of the treatment of these forests, gives us a firm basis to work upon in our subsequent lectures.

With reference to forestry instruction at Dehra, I am glad to see that silviculture has returned to its former place in the programme, which was altered in 1887 against the wish of the Director, by the Forest Conference. Previously to that year, silviculture was taught in the forest, after the necessary preliminary instruction in botany and other auxiliary sciences. That practical forest work was thoroughly taught at Dehra, before 1889, may be gathered from all the early school reports, and from a review in the March number of the *Indian Forester* for 1889, written by a distinguished Indian Forest officer, who praises, "*the thoroughly practical way in which forestry was taught*," and states, obviously after a personal experience of the lectures, "*that Mr. Fernandez' forestry instruction was of a character to stop the learning of lessons by rote and to make the students think, instead of merely reproducing the teacher's work.*" Instruction at Dehra has always been largely of a practical nature, the students spending eleven months in the forest during their course, and it is satisfactory to hear that this continues to be the case. Whether too much theory may not be crowded into the eight months of two rainy seasons, is another question for the consideration of the Controlling Board of the Dehra Dún Forest School.

As this letter has passed through my hands on its way to Press, I feel obliged to explain that Mr. Fisher has misunderstood a considerable part of what I wrote in the March number.

What I then wrote was not intended to have any special reference to Coopers Hill, but to discuss the impression which his paper in the January number had given me of his opinion on the *general* question of 'theory' *versus* 'practice.' If he or anyone else has taken what I wrote to refer to the Coopers Hill College, I can only regret that I wrote so clumsily as not to make it quite clear that such reference was not intended. I have naturally a very fair knowledge of what is done at Coopers Hill and my writing was intended to be purely general. As regards Dehra Dún, I quite fail to see how my words could be taken as a comment on the past, and they most emphatically were not intended to be anything of the kind. I have far too much to do with the present to trouble myself very much about the past and I can only regret that anybody should have imagined otherwise.

I can only further regret that my friend Mr. Fisher should have made such a series of inferences from what I wrote. I shall not attempt to reply to them, but allow, as Editor, the present letter to close the discussion.

J. S. GAMBLE,
HON. ED.

Coorg and its Timbers.

Perhaps before commencing a description of the more valuable timber trees of Coorg, a short account of its locality and topography will be interesting. A good many of my readers, doubtless, have somewhat hazy ideas of where Coorg is. I know when I was ordered down here, I had to study the map of India before I was certain where I was going. Coorg is a triangular piece of country in the S. W. corner of Mysore. It is bounded on the north and east by that State, on the south and partly on the west by Malabar, the north western corner being touched by South Canara.

Its topography is easily described. There is a narrow flat strip of land along the eastern edge widening in the S. E. corner to about 7 miles broad. This strip is cut in two about two thirds of the length of the border from the north by a spur of the ghats which runs out into the Mysore country at Siddeshwara. The rest of Coorg is on the western ghats, the highest point in the Province being Tadiandamol, a noble hill forming part of a high range running parallel with the South Eastern border. The height of Tadiandamol is 5,729 feet. The scenery in Coorg is very beautiful. To the lover of the hills, every gorge, every ridge presents some new pleasure to the eye, while in the east and north east, the cultivated plain, broken by park-like groves and well avenued roads, yields a milder scene. Again, in the depths of the forests in the South-East, yet a third variety of beauty is to be found. Here the giant stems are mixed with dense leafy undergrowth and the rigidity of the forest tree, modified by the graceful wave of the bamboo. Every road through these forests presents vistas of great beauty and an artist would revel in Coorg for he would find a picture to hand wherever he went.

The climate of Coorg is so totally different to that of the plains that it is not easy to compare it. Once the rain falls in April, it is, to one who has experienced the hot weather in the N. W. P. and Oudh and the Central Provinces, delightful. But there is the absence of the invigorating cold weather of those parts of India, which is a serious drawback to Coorg. Again, the very heavy rainfall in the monsoon makes the provincial headquarters anything but a desirable residence. Along the Eastern border the rainfall is much less, and not least among the noticeable points of this province is the extraordinary variation in the rainfall on the western and the eastern borders. This difference is as great as 200 inches.

The tree vegetation of Coorg is sharply divided into deciduous and evergreen. The two classes intermix along the eastern slopes of the ghauts but by far the greater area of Coorg is covered with what may be practically called evergreen forest. For even

the deciduous trees which are to be found among them nearly all over the district seem to alter their habit and so arrange their leaf-fall as to ever present a bare appearance. This is very noticeable in the figs On the east, in the month of March and in the first part of April, the forest is much in the same condition as it is in the Central Provinces at the same time of the year, but the middle of April brings with it heavy showers of rain and in a few days the forest is green again, having been bare for but a short time Indeed the leafing is so varied with different trees that the forest is at no time absolutely devoid of leaf

The best timbers in the deciduous forests are.

Teak (Tectona grandis).
Honné (Pterocarpus Marsupium)
Bíté (Dalbergia latifolia)
Mattí (Terminalia tomentosa)
Nandí (Lagerstrœmia microcarpa)
Arsantega (Adina cordifolia).
Kadiála (Stephegyne parviflora)
Ulwé (Terminalia paniculata,
Udé (Bignonia xylocarpa)
Jálá (Shorea laccifera)
Nogá (Cedrela Toona)
Bilwárá (Albizzia odoratissima)

Teak is, of course, the most valuable. It is found in the largest size and quantity in the south east forest —Nalkeri and Hotgat. Here it attains a great size and there are giants in these forests which owe their escape from the axe principally to their being too large for removal These trees are, however, comparatively short in the bole and do not exhibit a really fine growth Many of them are double stemmed, most are hollow and the younger trees are very crooked and ill grown Teak is plentiful all along the eastern border but gradually decreases in size as we go north Thus, Anekadu and Atlur Forests, at about the centre of the eastern edge, contain trees of moderate size, the greater number hollow and almost all badly grown, while Malambi, India and the other north eastern forests, though containing much teak, possess no large trees, the growth being mostly large poles and third class trees

Teak practically disappears in the centre of the Province from below Kirajpet to the north-west corner of Mysore, and from the foot of the rise to Mercara, about seven miles from the eastern border, to well over to the west of that town, no teak is to be found, but it re-appears on the western slopes of the ghats overlooking South Canara where there is a fine teak forest, and again on the Cannanore Road Here I one day came across a butt end of a tree which had first been dragged out by elephants As I stood close to it, I could not see over it and I am 5 feet 10

inches high in bare feet. There are probably some giants still existing in the more inaccessible gorges and ravines in these slopes of the ghauts.

The teak of Coorg is a good wood but very liable to heart-shake in felling. It would be worth while experimenting in girdling. The only statistics of yield that are available, comprise the export to our depôts on the east of the district and in Mysore. I find that during the past five years, the following quantities have been brought to the depôt.

1887-88	...	...	29,576	cubic feet.
1888-89	...	...	40,138	do.
1889-90	...	...	30,400	do.
1890-91	...	...	31,890	do.
1891-92	...	...	21,585	do.

The fall in the quantity brought to the depôt in 1890-91 is due to fellings having been stopped while the stock in the forest was being valued. There was reason to believe that much of the timber shown on our books had been burnt or lost. The natural reproduction of teak in Coorg is not good, and has to be supplemented by other means of growing trees. These are three in number; regular plantations, planting out in the forest and kumri. Dibbling seed does not answer, the coarse grass in the south eastern forest killing the young plants.

The only regular plantations which are extended are those at Kutampollé on the Cannanore road at the foot of the ghats. All others further north and east are practically failures and any continuation of the work there has been abandoned. The Kuttampollé plantations now cover acres. The system has been to clear, fell the area intended to be planted and supply it from a nursery. In my opinion the results are not commensurate with the expenditure. Pure teak plantations were long ago abandoned in the Central Provinces and judging from the appearance of the Kuttampollé plantations, I should say that pure teak does not answer here, even though the heavy rainfall and the great heat assist the growth. In November last when the surrounding forest was a wealth of leaves, those of the teak in the plantations had been destroyed by an insect *Every leaf*, without a single exception, was a beautiful net work of fibres with the cellular tissue eaten out. The leaves had turned brown and from the top of the hill the planted areas were clearly noticeable, they being brown patches in the midst of the surrounding green, their edges being sharply defined. The growth of the trees, too, is not satisfactory. The stems have a sickly appearance, and I cannot but think that pure teak is a mistake. However, the usual extension is being made this year, but in addition I am planting up a large area by clearing lines in the standing forest. These young plants will require looking after the first two years of their life and care must be taken that they are not suppressed by surrounding vegetation but the method is a very much cheaper one and it will, I believe,

prove a more efficacious way of stocking a forest. This second system is this year being tried in Nalkeri and Dubare on the eastern border. Our works have been much crippled owing to the failure of the crop of teak seed. But next year, it is hoped, will see this method of stocking forests more fully carried out.

The third way of introducing teak is kumri. It is too well known to require description ; as yet there is only one kumri in Coorg. This is on the eastern border a little below the middle of the same. It has proved another failure. Ten acres were given over to Kurumbers who sowed "raghi" and at the same time put young teak out. Owing to want of water the seeds were not put down in the nursery till so late in the season that when it came to transplanting them they were still but little tiny plants. The cessation of the monooon caused them to droop and when I last visited the field, after the April showers had caused the surrounding forest to burst into green, there were only a few miserable little strugglers against adverse circumstances of the thousands which had been planted. A small extension is being tried during the current year but its failure is, I think, certain. The introduction of teak by kumri in the ghat forests had long been contemplated. Kumri is much practised there but no attempt had been made to utilise it for the planting of teak. However, this year Mr. Meiklejohn, the Commissioner of Coorg and myself, on a tour in the western ghats made a determined effort to induce some of regular kumri ryots to take to planting teak. Every one who has had to introduce a novelty into India knows how difficult it is to get the ryot to take to anything which his grandfather had not done before him. The people in the ghat are very wild and uncivilised and it was only after much persuasion we induced them to agree to try one acre each. It was somewhat late in the season but I hurried up the supply of seed and everything promised a real start when all our efforts were rendered of naught by the pigheadedness of a Ranger and the matter will have to stand over till next year. It still remains to be seen whether this system is a success or otherwise.

In a country so fully stocked with forest as Coorg, it is to teak and honné on the east and teak and one or two other trees on the south and west that we must look for revenue and the Department should leave no effort to increase the growing stock of this tree. The gradual, and by no means slow, exhaustion of the Mysore forests, will render money spent on the propagation of teak well laid out; and teak still maintains, and will maintain, its pre-eminence among the timber trees of India.

The next valuable wood in the deciduous forests is honné (*Pterocarpus Marsupium*). This is found in the eastern forests and extends considerably more to the west than does teak. It is to be seen almost up to Mercara itself, but is rare, if it exists at all, on the western ghats. Though its market price is considerably lower than that of teak, it is in great demand, being much used for building purposes. The D. P. W. in Coorg now use nothing

else and I never find decently sound honné lie on my hands in my depôts. It grows to a considerable height but rarely, if ever, attains the enormous girth that teak does. Its reproduction is somewhat unsatisfactory and small poles of honné in most of our forests are conspicuous by their absence. It coppices poorly but as it is a very large seeder, it will doubtless assert itself where we can keep out fires.

There is no need for me to enlarge on the excellent quality of its wood. Strong, elastic and durable for certain purposes such as beams carrying heavy weights, it is really more valuable than teak; while its kino preserves it from damp and insects. The quantities brought to depôt during the past five years are as follows. Its price varies very much, but at present there is a great demand and I have sold honné for one rupee a foot but its usual price is ten annas.

1887-88	...	...	20,619	cubic feet.
1888-89	..	...	29,967	do.
1889-90	...	...	15.396	do.
1890-91	...	...	15,382	do.

Fellings of honné were stopped in the year 1890-91 for the same cause as given under "Teak," But the stock in the forest was sufficient to supply the depôts with a fair quantity.

The next on our list is Bîté or Blackwood. Though this wood is used principally for furniture, there is a very large demand for it. It is so eminently ornamental that is is used for many purposes for which it would not be available where it was not so plentiful. A graceful tree, it grows to much the same size as honné and is the constant companion of the latter in the forests, in the east and east centre of Coorg. Its habitat extends further into the evergreen forests that even honné. Its very great weight is a factor against its transport but there is a compensating fact in small logs being as utilisable as large ones. Just at present there is a heavy demand for Blackwood and all stock either has been sold or is likely to be disposed of. Its reprodution is good. Its habit of throwing up suckers and coppice shoots gives it a great advantage over honné and if I can only enforce the system of felling flush with the ground, I hope to see our forests well stocked with blackwood.

Honné and Bîté are much liked by coffee planters for shade, whereas teak is their *bête noir*.

The quantities brought to depôt are given below. The price of blackwood is generally from an anna to two annas per foot higher than honné.

1887-88 1888-89 1889-90	not shewn separately from other woods in the returns.				
1890-91	...	...	...	1,458	cubic feet.
1891-92	...	...	...	3,754	do.

With Blackwood ends the list of deciduous trees which at present fetch anything like decent prices in the market in Coorg. Matti (*Terminalia tomentosa*) is, in log only, used by cartmakers for the pole and body of carts. As a pole it is very popular in housebuilding. It is interesting to note the different uses to which the same tree is put in different parts of India and how the one tree is thought highly of in one place and is valueless in another. This very Matti is never used, as far as I know, in the C. P. in cart building and the immature trees are considered so untrustworthy for building purposes that they are never used unless felled at a certain time in the year. There, and all over the Mahratta country, the "Dindiga" of Coorg, the "Dhaora" of the C. P. and Khandesh (*Anogeissus latifolia*) is *the* wood *par excellence* for cart axles, and, where procurable the Tinsa, Tinnas or Tewas (*Ougeinia dalbergioides*) for cart poles.

Though there seems an undefined idea that Matti takes the *pas* in woods, still I am of opinion that the latter is really a more valuable tree all round than the former. It grows well and straight, is not so liable to unsoundness as other trees, reproduces itself strongly and sustains adverse surroundings better than most trees. Its wood is easily worked and, provided it is not exposed to much damp, turns out excellently. In furniture it is eminently useful and for beams, &c, makes a good material. In appearance this tree is twin brother to the Kahu or Arjun of the C. P. and Upper India (*Terminalia Arjuna*) and it was not till I had been about my forests sufficiently to know that this latter tree is rare in Coorg, that I could disabuse myself of the belief that the Mattis I saw were Kahus.

The remaining trees mentioned in my list are used for building purposes and are mostly cut as poles. Coffee is transported in bags, we therefore have not here to solve the problem of a suitable wood for boxes which gives such trouble to those whose lot is cast in tea growing districts. But there is a peculiar interest in the Noga (*Cedrela Toona*). Every reader of this journal knows how valuable the wood of the Tun is considered in Upper India but here it is practically unsaleable. It grows to be a magnificent tree, often in the ghats being the largest in the forest. But the timber, as an an article of commerce, is unknown. I was disappointed in the attempt made to have the wood tested as a material for furniture but I hope, before long, to discover whether the wood is as good here as in the North West Provinces. The quicker growth may possibly affect its hardness and the wood may not be of the quality it is further north, where the growth is slower, but I may be able to tell you the result of my experiments.

The detailed description of Evergreen trees must be put off till next number.

G. H. FOSTER.

Useful Maxims for Tree-planting.

In making plantations, if you wish your plants, whether they be forest trees, fruit trees or others, to prosper and develop well, *plant them on a level with the ground.*

Forest trees spring from seed which has fallen on the uncultivated ground which is often hard, covered with herbs, or other plants, and seldom so well adapted to receive the roots as the holes in which artificial sowings are made. All the conditions in a forest are generally less favourable, except one and that is that seeds rest *on* the ground.

Take for example large trees of any species. The strong protruding roots which have come half out of the earth at their birth, at their point of attachment to the trunk, do not these show what position is natural and necessary to them with reference to the surface of the soil ?

Trees buried beneath mounds of earth, offer a proof of the reverse. They either die or languish until they are able to establish a system of surface roots and by that time the old ones are dead, the reason being that roots require air just as much as water and nutritive materials.

As a rule in planting trees, a hole is made more or less deep, the root of the plant in placed in this and then the hole is filled with soft earth. The collum of the root is already below the level of the soil, and gradually the soft earth shrinking and becoming more compact, sinks down, and the collum, as well as the roots, sink with it to some 6 or 8 inches below the surface of the ground. Ere long it becomes necessary, that is in two or three years when the worked up soil has again become hard, for the roots to raise their extremities in order to live, or for new roots, not so good as the old ones, to develop above these latter.

The success of planting on ridges, recommended for wet soils, is easily explained and shows clearly the advantage of surface planting which is general. In planting, therefore, wherever possible, deep holes should be made, but these should be refilled with pulverized earth pressed down a little with the foot before the plants are placed in them. This earth will then retain moisture well and this will rise gradually as the surface soil dries and assure the success of the transplant. The roots of this latter should not be placed deeper than the surface of the soil and in covering them with a small heap of the best earth available, instead of pressing this down to the bottom of the hole as is often done, the roots of the young plant should remain undisturbed and the gradual sinking down of the pulverized earth will slowly bring down the collum of the root to the level of the soil.

This method is always applicable. One may see quite young plants of Spruce Fir, for instance, which have been deeply buried in the soil, linger for as much as 10 years before beginning to

increase in height. How is it possible that the roots of such a tree, which are essentially spreading roots, should develop at a depth of 8 inches below the surface? If the transplants are of large size, whether fruit trees or forest trees, before filling the hole place in it a proper support and do not fix the tree until you have arranged to support the collum at a fair height above the soil. Trees planted thus with the collum 6 or 8 inches above the level of the soil succeed astonishingly well. In rocky, hard or unfavourable soils, surface planting is absolutely essential, the future success of the plant is thereby assured; whereas if the roots are buried in the rock, in holes or among stones, they will die off sooner or later. The precautions to be taken in order to favour the re-growth (such as covering with grass, moss or stones) are well known and perhaps less important. Surface planting meets every case, even the most difficult.

Finally, make experiments. Take a number of similar subjects, plant them, some with the collum 8 inches deep, the rest with it 8 inches above the level of the ground, and note the development of each, the results will prove the truth of what is stated above.

C. B. in *Révue des Eaux et Forêts*
of February 10th, 1892.

II.—CORRESPONDENCE.

The Seeding of Bamboos.

Sir,

The following information regarding the flowering and seeding of bamboos in the Darjeeling District is taken from the draft Working Plans Report for the Darjeeling Forests, prepared by Mr. Manson:—

"*Maling*, Nep. (Arundinaria racemosa, *Munro.*) Flowered in "Sikkim at the end of 1888—thirty-one years since the last "recorded time. (Authority, Mr. J. S. Gamble). *Gopi*, Nep (Cep- "halostachyum capitatum, *Munro.*) Flowered at the end of 1874 "and died after seeding (Authority, Mr. Stölke and Gamble's "Manual of Indian Timbers) *Nibha*, Nep. (Bambusa patellaris, "*Kurz*) Flowered at the end of 1861 and died after seeding "(Authority, Mr. Stolke). *Nigala*, Nep. (Thamnocalamus spathi- "florus, *Munro*) Noticed by Mr. C. G. Rogers to be flowering at "the end of 1889." This last species called Nigala by the Nepalese was identified in Calcutta as Arundinaria spathiflora *Trinius var.* aristata. It came into full flower during the winter of 1890 and ripened its seed about May 1891. The seed was beginning to germinate at the end of May 1892. This bamboo is found principally above 10,000 feet elevation and occurs mixed with Rhododendron and Silver Fir.

H. H. H.

Fires caused by bamboo-friction.

Sir,

It would be interesting to know of the experiences of others regarding the firing of forests by bamboos when in friction. Last summer a fire took place in a block under special protection which I could only attribute to some natural cause It occurred on the *windiest of windy days*,—at a locality four miles distant from the nearest village—and in the vicinity of a check line running north and south—this line had been cleared and burnt long before of all combustible matter for a width of almost 40 feet. The wind was blowing due *east*, so had the fire occurred to the east of the line, no power on earth could have checked its progress on such a day until sundown, and instead of a few hundred acres, many square miles of forest must have been burnt And had any one maliciously fired the block—he would not have chosen the *east* of the check line. And had any one left the remains of his pipe on the line—with such a gale it could not have spread to the west side.

The fire seems to have originated on a small hill on which were (and are) a quantity of dry bamboos. Also it took place about midday—a time in the hot season when Natives will not willingly stir out, or go far from their villages Therefore, considering all the circumstances, I could only come to the conclusion that bamboo-friction caused this fire

We all know that the forest villagers frequently light their fires, &c, by rubbing two pieces of dry bamboos—so in certain very exceptional cases (such as violent storms) why should this not occur naturally ?

E. D

Reproduction by Extraction of Stumps.

Sir,

In an interesting article on the exploitation of the '*Quercus Ilex* in Provence, in the February number of the *Révue des Eaux et Forêts* the success of the rude but well known method 'saut du piquet' is described, the result being the growth of numerous root suckers, which fill up blanks, and make the reproduction of the forest much more complete than it would be with coppice shoots only

It is some years since in the Punjab we recognised that the regeneration of 'Jand' (*Prosopis spicigera*) in the "tar" forests depends chiefly on root suckers, at all events, that any improvement in the way of filling up blanks will be accomplished in that way and not by seed, hence the practice of leaving a large number of seed trees has been abandoned, and various experiments made with the object of increasing the crop of root suckers.

It is well known that these shoots from the roots of trees of which the stumps and main roots even have been dug out on the

compartment lines, are almost impossible to kill : year after year they have to be cleared away to keep the lines open.

This experience seems to point to the probability of the success of the 'saut du piquet' method being as great with 'jand' as with the chêne vert.

Hitherto our efforts have been rather in the opposite direction, tending to preserve the stumps most carefully, contractors being obliged by special clauses in their agreements, to have the stumps cut in a smooth and regular manner.

Possibly, if the contractors were instructed to break up the centres of the stumps and then cover them with soil, branches, etc., the result might be a considerable increase in the number of root suckers.

At all events, no harm can be done by making the experiment.

It would be of much help if some Forester would kindly give an illustration of the peculiar axe used in Provence for splitting the oak stumps, or else give a clear description, for that in the article referred to above is difficult to understand.

C. F. E.

A Departmental Blazer.

SIR,

I wrote to you a short time ago (December) on this subject, but seeing that a blazer had been or was about to be adopted *for the Forest School students* (as I then understood), I proceeded with the business I then had in hand, *viz.*, a blazer for the Indian Forest Service (Imperial), and am now in treaty with the Army and Navy Stores (who do much in this line) about patterns, which I expect to receive shortly. In my former letter I deprecated a bicycle club badge, but suggested that if we must have one, a tree would be the proper thing. As a motto is now wanted, I suggest that nothing is so truly apt for the forester as " Ars longa vita brevis." My latest pattern is a modest harmony of two quiet greens, one as ground color, the other more sparingly used to lighten it up. I have got a good many orders already, though the pattern is not finally settled, and expect all the men down here will go in for it. But before doing anything final, I will send you the patterns for discussion.* I then propose to send round a pattern to all Imperial Officers inviting them to order a blazer. As soon as about 40 are ordered, the cloth will be made. I hope all those who desire to contribute hints or opinions will do so promptly, as the matter is already arriving at a practical stage on our side, and it would not do for Bombay men to adopt a blazer that was not accepted elsewhere.

VELLEDA.

* We shall be glad to see them and send them to such of our correspondents as are interested in the subject.

'HON. ED.

DEAR SIR

I should like to make a suggestion with reference to the correspondence in the *Forester* regarding a 'Departmental Blazer.' Why not simply have a crown* above the monogram I. F. S. and no motto below? Old Coopers Hill men will remember the R. I. E. C. boating blazer, the ornamentation of which simply consisted in the monogram R. I. E C. in old gold with a crown above of the same colors, and it was voted by all to be as neat and sensible a badge as could be wished for.

Messrs. Preston and Pigott, who make the Coopers Hill blazers, would be, I should think, very good people to supply samples to be submitteed to the Committee as proposed by 'T' in his letter in the June number

OLD COOPERSHILLIAN.

* We are rather in doubt as to the right of the Department to a 'crown' as a badge, such as is allowable to *Royal* Corps and Institutions. At any rate it would have to be an Imperial crown, we presume.

HON ED.

The appointment of Foresters.

There seems to me to be a failure in the system of appointing "Foresters." The rules insist on their having passed the Middle Class Examination, no doubt in order to secure men of some *general* education. Unfortunately, mere general education is by no means sufficient for men who have such technical duties as have foresters—duties, too, absolutely demanding experience. Almost the only men available under this examination rule are schoolboys or bazar bred individuals with flowing robes and odorous of "hing" and "ghi."—Such creatures are, of course, impossible. Just fancy them controlling operations at a forest fire! The terror and hardships of a forest life are not for such as these. Give us straight men as hard as nails. If I quote my own Division as it was a short time ago, I shall give a good example of the "impasse" to which we often come. I had seven Ranges and four of them were held by Forest Guards—though three were lumped together into a Sub-Division under the Solitary Ranger I had, Foresters were not available from elsewhere and no single Forest-guard in the Divison had passed the Middle Class Examination.

To remedy this state of things I think the best system would be to abolish the Middle Class, and substitute a *Departmental*, examination to come, as hitherto, at the step up to the Rs. 15 grade. In this departmental examination I would have a few heads to obtain fixed minima in which is a *sine quâ non*, but among the remaining subjects deficiency in some heads should be able to be overcome by proficiency in others.

†For the important ranges of the future we are to have rangers appointed from the School, and, though I think more experience should be required of them, that is not what we are now considering—it is here only a question of the minor ranges to be held by foresters. My suggestion with reference to these is that no man should be appointed straight to a Forestership, but should begin as a guard and that every literate guard should be in a position to rise to Rs. 40 This would give a continual stimulus to good work and honesty and the "be-uméd" men—to whom the only object remaining is to make money dishonestly, would tend to disappear. But, of course, this would only be possible if the compulsory subjects were very elementary—and I think they should be ; for minor work what we chiefly want is sturdiness and experience.

The Middle Class Examination in these provinces was, I understand, as follows, this year :—

Bhusa Bhasker—Hindi reading apparently.
Gutka, 3 parts ditto
Hunter's History (in Hindi.)
Geography (ditto)
Euclid 2 books (ditto)
Mensuration (ditto)
Arithmetic (ditto)
Chandrika Prakirt (?)

I would suggest, as a substitute, the following subjects, those marked with an asterisk being the compulsory subjects :—

* Reading in the vernacular.
* Writing in the vernacular.
Dictation in the vernacular.
Reading maps with intelligence.
Surveying up to the standard of a Patwari.
* Arithmetic—including Decimals and Rule of Three, but not the highest part of the subject.

General considerations as :—

Intelligence, *activity, power of control, *integrity, experience.

Thus, provided only a guard got the required minima in the compulsory subjects, his being unable to make marks in such subjects as surveying, or dictation, might be counterbalanced by high marks in such heads as experience—or Power of Control,

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†*Note.*—Our correspondent can also get Foresters from the School. Just now, there are about six private students of the Vernacular Class all anxious for employment.

HON. ED.

thus enabling really deserving men to get on. And I would further prevent clever but morally inferior men from advancing, by giving them *minus* marks in the moral subjects.

The Departmental Examination might be held in each Circle when necessary—under the orders of the Conservator during the recess season.

There are some other points in connection with the Protective Establishment which I think might be altered with advantage, though, no doubt, they are not of paramount importance.

One is that of uniform. I think this should be approximate as far as possible in all the provinces under the Government of India, for somehow I think this would increase *esprit de corps*, and smartness in minor arrangements certainly tends to raise the status of the Service and to make the men feel there is "izat" in belonging to it. Thus when I see a guard slovenly dressed, I tell him that if he doesn't know how to wear the Queen's uniform, the right shall be taken away from him.

The Forest guard's uniform of these provinces seems a passably good one and serviceable, though no doubt it might be improved upon. Perhaps, for example a material of stronger texture might be found, and the men might have the option of having a woollen khaki-dyed uniform in cold weather. Then I certainly think "puttees" (of the same colour as the dark part of the puggri) should be insisted on—at least in the cold weather. The green edging always fades and look shabby and might without much harm be abolished. As to the dark green of the puggri, it would appear that no such thing as a green (save perhaps an awful pale green that is altogether impossible) that is fast-dyed is to be had and I would suggest pomegranate, which I believe could be used locally for re-dyeing (but am not sure). Boots, too, would certainly be most useful, but would have to be supplied by Government for they could not be got for less than Rs. 3-8 a pair. There would be no necessity to have square-toed boots three-sizes too large, like the North-West Provinces Police. It is most ludicrous seeing a guard pick up his shoes and rush through thorns and over stones to catch a delinquent.

Another alteration I should like to see would be the abolition of the word "Guard." The good old English terms are "Ranger," "Forester" and "Verderer:" we can dismiss the last but I think it would be better to have Rangers, including in the term all the existing grades of Forester, and Foresters which could correspond to the present Forest Guards. In John's times and thereabouts, the men employed to guard the royal shikar forests were I believe called "King's Foresters." The word "guard" recalls Military ideas and for goodness sake let us not pretend to be Military when we are not—the more especially as we have such a rich and picturesque body of tradition on which to draw.

A. G. HOBART-HAMPDEN.

III.-OFFICIAL PAPERS & INTELLIGENCE.

Rules for the study of Forestry by officers on furlough.

In view of the importance of maintaining in the Forest Departments of India a continuous knowledge of Forest systems of Europe and, for the purpose of encourging the study by their officers of Continental Forestry, the Government of India have, with the concurrence of Her Majesty's Secretary of State, decided that the privileges set forth in the rules appended to this Resolution may be granted, with their previous approval in each case, to selected officers of the Forest Department when on furlough.

The improvement of State Forests in India has depended, and will for some time continue to depend, in no small measure, on the adaption to them of scientific principles borrowed from France and Germany. Under existing arrangements, candidates selected for the Indian Forest Service undergo a preliminary course of practical instruction, for a few weeks, in the forests of either France or Germany; but progress in forestry is on the Continent so rapid that the knowledge which they acquire during their comparatively short tours, and at a time when their practical acquaintance with the subject is only commencing, is found to be insufficient for the needs of forest administration in India. It has therefore been determined to give facilities to officers, who have proved, by the merit of their work in India, that they are capable of assimilating and turning to account useful knowledge, to study forestry on the Continent when absent from India on furlough. Such officers if carefully selected, would, it is confidently anticipated by the Government of India, be enabled, both by their special capacity and their practical experience of what is required in India, to bring back with them and introduce into Indian Forest administration the most important improvements of the continental systems which may be applicable to this country, more specially in connection with the preparation and control of Working-Plans, in which exceptionally technical branch of forestry the greatest advance has recently been made in the Forest Departments of the Continent.

Rules under which selected officers of the Forest Department in India may be authorized to study during furlough, at the public expense, forest operations on the Continent of Europe.

I. A Forest Officer desirous of obtaining permission to study forestry on the Continent, under these rules, must submit an

application, through the Conservator under whom he is serving to the Local Government.

II. The Local Government will forward the application to the Inspector-General of Forests, with the remarks of the Conservator and its own recommendation in the case.

III. The Inspector-General of Forests will submit the application to the Government of India for orders.

IV. The Government of India will require to be satisfied that the officers applying is likely to profit by the additional experience he will gain by Continental study and that he possesses a sufficient knowledge of the language of the country which it is proposed that he should visit.

V. The application must reach the Government of India not less than four months before the date on which it is proposed to commence a Continental tour.

VI. If the application is sanctioned, the officer should place himself in communication with the Inspector-General of Forests, under whose instructions the plan of study proposed will be arranged.

VII. On arrival in England the officer will report himself at the India Office; and it will then be decided by Her Majesty's Secretary of State what localities he is to visit.

VIII. The total period to be spent on deputation will not, as a rule exceed six months. At the end of that period the officers selected will submit to the India Office a diary showing how his time has been spent, and a report which should indicate fully the nature of the operations studied, and which should also include suggestions as to the application of such operations to India. The Secretary of State will decide whether the diary and the report show that the time of the officer has been properly employed, and will determine accordingly for what period the daily allowance admissible under Rule IX may reasonably be granted.

IX. Each officer will be paid, through the India Office, the cost of a 1st class return- ticket between London and the place to which he may be initially deputed, and will also subject to the preceding rule, be granted a daily allowance of 10 shillings during his stay in the Continental forests. Travelling allowance bills in full detail must be submitted to the Revenue Secretary at the India Office.

X. The reports, notes, and drawings submitted by an officer may not, without the previous permission of the Government of India, be communicated to any professional journal or institution; and the Government of India will be at liberty to print, publish or circulate them should they think fit to do so.

Report on the physique of Junior Forest Officers.

We have received copy of a Government of India Circular on, this subject dated May 20, calling for "a report on the physique 'and suitablity, in respect to general health and constitution, for 'Forest duties, of each of the Forest Officers who have been 'appointed from England by Her Majesty's Secretary of State 'since 1887-88, *i.e.*, who arrived in India during the years 1888, '1889, 1890 and 1891."

The Resolution goes on to explain that—

"The object of this enquiry is that the Government of India 'may, if the facts elicited should seem to require it, submit further 'representaions to Her Majesty's Secretary of State as to the neces- 'sity of employing great caution in selecting candidates for a 'service in which a sound physique is so essential, both in the 'interests of the State and those of the officers who belong to the 'Department."

The new Edition of the Code

It seems that there is some hitch in bringing out this, so the Government have published Part I and the Appendices first of all.

We hope that the hitch means that the Code is to be simplified and the number and size of forms reduced, one signature only being required on pay and travelling bills instead of the many now insisted on.

We also hope that the authorities will utilize the delay in giving us once more our Departmental List now missing for a year and a half?

Report of the Board of Control of the Forest School Dehra Dun.

We select from this Report the following portions which we think are most likely to interest our readers. The Board for the year 1892 consists of the Inspector-General and Director as usual, with Mr. E. P. Popert and Major Bingham, Conservators. We hope that some of our correspondents will give us their opinions on the last paragraph.

"That the Board have observed the low marks obtained in mathematics at the final examination in March of the current year. They are convinced that this result is due to the fact that the questions set were, for the most part, on the application of

'Instruction in Mathematics: text-book required.

'mathematics to practical forestry. The Board consider that 'questions of this character are essential, and have ascertained that 'the want of a suitable text-book is much felt. They recommend, 'therefore, either the translation into English of Koenig's *Först 'Mathematik*, or that the preparation of an original work of similar 'character should receive attention. The Board are of opinion 'that the grant of an honorarium of Rs 600 should be offered for 'this purpose.

'Marks to be allotted for 'forestry.

'That the Board are of opinion that the degree of prominence accorded to Sylviculture in the final examination is insufficient. They accordingly prescribe that, in lieu of the marks allot-'ted for this subject by the Board in 1891, the following should 'be substituted:—

'Forestry	Sylviculture	500	1,000.
	Working-Plans ...	250	
	Utilization	250	

'Failure to pass final ex-'aminations.

'That no student, whether Government or private, who (*a*) has been unable to present himself at the final pass examination, or (*b*) who, having presented himself, has failed to pass that 'examination, shall be admitted to appear at a subsequent pass 'examination, unless he follows a second time the whole course 'of instruction at the School, or, at the discretion of the Director, 'the second year's course.

'Entrance of European 'and Eurasian students to 'the School should be dis-'couraged.

'The Board are struck by the constantly increasing number of European and Eurasian students admitted to the School, presumably attracted thereto under a misapprehension of the rules and conditions of the Service and of 'the prospect of their attaining to the higher posts. As a matter 'of fact, a certain percentage only of the passed students can attain 'to the rank of Extra-Assistant Conservator, and can only reach 'that rank after several years of approved service. In many 'instances the conditions of the administration of a forest range are 'such that an European is not so suitable as a native for the work 'required. The Board consider that the admission of Eurasians 'and Europeans to the School should be discouraged, and desire 'that the Inspector-General of Forests be requested to bring the 'subject to the notice of the Government of India.

'Expenses of students at 'the School.

'The Board having taken into consideration the question of the cost incurred by students living at the School, the Deputy-Director gave, as an estimate of this cost, Rs. 75 to Rs. 85 'per mensem, independently of travelling expenses. The Board 'consider this cost too high, and cannot recommend Government to 'subsidize the students above the pay to which they are entitled when on service in their Circles. The principal question is the 'cost of joining and continuing in the mounted volunteer corps.

'The Board fully recognise the value which the students derive 'from learning riding and discipline. The latter could be equally 'well obtained by a foot-corps. The Instructor, in charge of the 'forest division of volunteers, showed that the purchase and hiring 'of horses devolve entirely on the officers of the corps, and that 'the only outlay which a student has to incur is Rs. 15 per mensem 'for the up-keep of a horse. But even under these circumstances 'the Board consider that, as the students are in effect obliged to 'join the mounted rifles, no part of the expenditure incurred should 'fall on them or on their parents. The Military Department 'should be addressed by the Inspector-General of Forests with 'a view to obtain for each European student the use and feed and 'keep of a mount during his stay at the School. In the second 'place, the Board, having inquired into the question of the cost of 'athletic clubs, find that there is but one such club at the School 'of which the subscription is voluntary and amounts to Rs. 4 per, 'annum only, and are of opinion that the students should be 'encouraged to join this club.

'That, with reference to the following Note, which was placed before the Board for consideration, an immediate Resolution thereon would be premature; but that the Inspector-General 'of Forests be requested to cause the proposals therein contained 'to be circulated to Local Governments in order to obtain the 'opinion of Educational and Forest officers; and that the subject 'should be brought forward for final discussion at the meeting of 'the Board in 1893:—

'Future recruitment of 'candidates for Govern- 'ment service.

'*Note on the subject of securing a better quality of Native Candidates for the Forest Department.*

'The subject placed before the Board, for consideration, is that 'of securing a better quality of native candidates for the Forest 'Department.

'There is no doubt that hitherto the standard reached by the 'average of native candidates who enter as students has been very 'much below what it should have been when the facilities given, at 'public expense, for education in this country are considered. This, 'it may be admitted, has been partly due to the insufficiency of the 'prospects offered, compared with those offered by other official 'services, but not altogether so. Other causes, which will be dealt 'with further on, have operated. Prospects, however, have now 'improved, and it is perhaps all the more important to take care 'that other causes do not interfere with the attractions which they 'offer and prevent the Forest Department from securing the best 'candidates available.

'The "other causes" which lead to a low standard of qualifications in forest candidates are:—

'(*a*) Insufficient knowledge in our educational establishments of the conditions and advantages of the Forest Service.

(*b*) Absence of competition before entry. [If *A*, *B*, *C*, *D*, &c, are candidates for nomination, *A* being better than *B*, *B* better than *C*, and so on, *D* has just as good a chance of being nominated as *A*.]

(*c*) Absence of strict conditions in the matter of nomination. [A Conservator or a Secretariat official may send up any one he pleases—the son of his Head Clerk, &c.—who is likely to pass the entrance examination.]

(*d*) Absence of competition after entry. [This does not affect, it is true, the quality of the candidate, but it affects his value when turned out of the School as a passed student.]

The following principles or canons are suggested as a desirable basis for any scheme framed with the subject of improving the quality of forest students:—

(1). A forest education is a close and special education which is not suitable for any other profession.

This principle is acknowledged at Coopers Hill College. Consequently the students for the Forest Department are selected by competition before entry and not, as in the case of Engineers for the Public Works Department, at the end of the course. The second canon to be laid down might, therefore, be formulated as follows:—

(2). There should be competition for Forest Studentships before entry to the School.

But, as each province has to nominate its own forest officials, it is necessary that—

(3). There should be separate competition in each province.

In view of the desirability that the Forest School should not be burdened with an excessive number of students, and also of the fact embodied in canon (1)—

(4). The number of candidates selected from each province should be limited to the number for whom it is likely that appointments will be available.

In order to attract the best possible candidates, a portion of the allowances which Local Governments are empowered to grant should be offered as scholarships It should, therefore, be laid down that—

(5). The students who succeed best at the provincial examination should receive scholarships.

The scholarships might be say, Rs. 30 a month. But in order that students unfit for forest work may not be allowed to gain scholarships, a preliminary personal examination of them should be made beforehand by a Board, of which Conservators and selected Deputy-Conservators should be members, who would reject, *in limine*, unfit candidates. Some rule should, therefore be laid down to the effect that—

(6). No candidates should be allowed to compete for forest scholarships until they have been passed by a Forest Board as fit for forest service.

In order to induce competition at the School, the remainder of the allowances now given by Local Governments may be offered in the form of six-monthly prizes to those students who succeed best. Students might be divided into, say, four classes—

Class 1 would get, say Rs. 20 a month
" 2 " 15 "
" 3 " 10 "

for the next six months. If all the students did sufficiently well, they would all go into Class 1. Special money-prizes might also be given to those who did best Class 4 would get nothing. But the principle laid down should be that—

(7). In order to stimulate exertion at school, a portion of the provincial allowances should be utilized in the form of six-monthly prizes or school scholarships.

Whether it is worth while to go further than this, and make any conditions as to future promotion in the Forest Department depending on success at the School, is perhaps doubtful. Success at school would presumably always be taken into account in promoting from rangerships.

The suggestion may be added that any rules laid down for the examination for provincial scholarships should be approved by the central Forest Board. It would be a matter on which all Conservators should perhaps be consulted.

It seems desirable that at provincial examinations marks should be given for natural sciences, which are now in India beginning to receive some attention at the schools. The subject may be made an optional one, but should not be overlooked.

There seems to be no reason why private students should be encouraged to come to School. They need not be excluded. But when the new re-organization scheme has once got into working order, it is difficult to see what chance there will be for private students to obtain appointments.

A suggestion may be offered that provincial Conservators should be invited to take personal trouble to induce the masters of schools and colleges to pick out their most suitable students as candidates for the forest scholarships. Marks might possibly be allowed for special certificates from schools; but, however this may be, there is no doubt that personal selection of fit candidates, in communication with the best masters and teachers in a province, will be found very useful. This plan was acted upon with considerable success in choosing candidates for the Land Record Department in the North-Western Provinces. It is considered that the time will soon come when the progress of education will bring forward many more candidates for forest service than now apply for it, and it would seem to be as well to lay down rules and principles regulating competition before the rush comes.

IV-REVIEWS.

Annual Forest Administration Reports of the N.-W. Provinces and Oudh, and Coorg for 1890-91.

We have now gradually but briefly reviewed most of the Reports for 1890-91. One by one, we have referred to the chief works done in Bengal, the Punjab, Assam, Baluchistan, the Central Provinces, Madras and Berar. The Reports from Burma and Bombay have not yet reached us In the Report on the *North-Western Provinces and Oudh* there is not much which calls for special remark We fully approve of the remarks made both by the Local Government and the Government of India on the necessity for strict adherence to Working Plan Provisions. We would even go further than the Government of India and allow no changes, except of the utmost urgency, until a general revision takes place , otherwise we should have officers holding different opinions altering each others works so constantly that it would be next to impossible to maintain proper record, certainly not such a difficult record as that prescribed by Forms 2 and 3 of the Code. At the same time, though we think that the main provisions of Working Plans should be very strictly kept to, we consider that greater latitude should be given to Conservators especially in such questions as works of improvement, for it seems rather absurd that they should have to obtain special Government sanction when they have funds to spare and can do an extra amount of creeper-cutting or planting to the benefit of the forests.

The remarks on ' Natural Reproduction ' in the Central and School Circles evidently refer to different years, for while the Central Circle Report comments on the absence of Sal seed (probably in 1891, but if so, it must have been after the close of the year), that of the School Circle says it seeded well, in 1890 As a matter of fact, 1890 was a good year for Sal seed, and 1891 a very bad one. Both Reports speak strongly on the damage done by frost in the Sal forests in the winter of 1890-91

The discussion of the question of half-measures in the Chir Forests so as, on the one hand, to get some reproduction and on the other to let the hill people go on with their favourite amuse-

ment of firing the fine-needles, goes to show that such half measures are not very likely to succeed. In our opinion there is only one possible measure and that is protection from fire; and if it is found desirable to keep the grass from being spoilt for grazing, money must simply be spent in clearing away the pine needles artificially. Whether the villagers will agree to this, is perhaps doubtful, and if it is impossible to ensure fire protection, it seems to us that there is nothing for it but to consider the areas simply as grazing lands and abandon any hope of maintaining a permanent forest. The Government of India have quite rightly remarked that "no improvement can take place in the condition of forests so long as their firing is permitted;" that it has for so many years been permitted in any Reserved forest without endeavours to teach the people better, is matter for some surprise.

The gross revenue of the year was Rs. 16,37,879 and the net revenue Rs. 7,18,982 so that the surplus was 44 per cent of gross receipts which is clearly satisfactory.

In the Coorg Report there is not much to be noticed except the unfortunately ill-success of the works of fire protection. We think it may be of interest to publish the following extract. "But in spite of the unfavourable season, 'there is good reason to suppose that the efforts of the staff 'would have been successful in protecting a much larger area than 'that reported, had we only had accidents and the results of 'ordinary carelessness to contend against. This however was not 'the case; and it may be stated with much confidence that the 'larger number and most destructive fires were designed either 'for purposes of *shikar*, or by graziers, with the view of stimula-'ting a new grass crop, or of burning down the standing 'residue of the old one; while in some cases it is feared that they 'were caused by persons bearing a grudge against the department.'

'During the month of March, in which most of the damage 'was done, fires were continually being lighted inside the forests. 'They always occurred inside, and under circumstances which 'increased our difficulty in extinguishing them. For example— 'several fires occurred on bazaar days, when it was impossible to 'collect assistance and when the forest coolies were absent on '*private affairs*. They were also often lighted late in the even-'ing, so that several hours probably elapsed before they were dis-'covered; and they were lighted in two or three places at once, 'so that our available parties were split up and often inadequate, 'in consequence, for the work in hand. These remarks are especi-'ally applicable to the Arkeri reserve, where 23 separate fires 'occurred in March, by which 12,801 acres were burnt, or 70 'per cent of the entire forest. No sooner were fires extinguished 'in this area, than others were lighted, until the staff became 'completely exhausted and demoralised by the continual day and 'night work carried on under most trying and disheartening cir-'cumstances. Two Foresters were severely burnt in the performance

'of their duties. In one case, in the Anekadu reserve, a fire was 'lighted in the early morning about 3 miles from the forest head 'quarters, and when the staff was absent and engaged on putting 'out this fire, a second one was lighted inside the large teak 'plantation at Anekadu, which was burnt from end to end. The 'Commissioner was good enough to inspect this latter area, accom-'panied by the Deputy Conservator, and the local Soubadar was 'ordered to hold an inquiry into the origin of the fires, and to offer 'a reward of Rs. 50 for any information tending to convict the 'offenders, but no information was obtained. In the Dubari 'forest—and this most unfortunately was the only case in which 'an offender was caught—a man was arrested by a guard when 'actually applying a lighted stick to the grass, and on conviction 'imprisoned for three months.

'These facts, coupled with the circumstances relating to the 'planned fires of Hutgut and Nalkeri, recorded in last year's report, 'leave no doubt in my mind that by far the larger number of our fires 'are caused, not by accident or by carelessness, but on purpose; and 'that unless the Forest Department receives extraneous assistance 'either from the Revenue Department or through or some repres-'sive action of government, such for instance, as suspending the 'exercise of rights in those areas where fires are most frequent, the 'work of protection will be more a matter of fortune, dependent 'on a wet or dry season, than the result of protective arrange-'ments, however good these latter may be. It must however, be 'confessed with regret that the forest officials have dismally failed 'especially in South Coorg, to lessen the offence of forest burning 'by arresting the offenders; but no offence probably is so easy 'to commit without being discovered, and the conditions of the 'establishment in Coorg are adverse to an energetic prosecution 'of the offenders.

'It is the general opinion of the forest officials, and, I 'may also add, of the planter community, that one of the chief 'causes of these forest fires is the large number of guns owned 'not only by Coorgs and *jama* ryots, according to the Arms Act, 'but by Kurubars and other jungle tribes, most of whom appear to 'possess one of some sort, but without license or authority for 'such possession. Our forests are still visited by these unlicensed 'sportsmen, who in the season, which unfortunately is also the 'dry hot season, are reported to burn the grass for tracking 'purposes and generally to enable them to move about freely. 'Were the Arms Act to be enforced in this province, and only a 'limited number of persons, besides those specially mentioned in 'the Act, allowed to use guns, I am persuaded that there would 'soon be some diminution in these fires."

The gross revenue of the Coorg Forests in 1890-91 was Rs. 135,561 and the surplus Rs. 69,743 or 62 per cent of gross receipts which is satisfactory.

Number of Species in the Java Forest Flora.*

We have received from M. Koorders his pamphlet which shews that there are 975 species of plants in Java affording forest trees, taller than 5 metres and with stem diameters of more than 10 centimetres. These 975 species belong to 391 genera and 76 families. As might be expected, the chief families are Leguminosæ, Urticaceæ and Euphorbiaceæ, but there are also many genera in Sapindaceæ, Rubiaceæ and Anonaceæ.

*Bijdragen tot de kennis der Boomflora van Java, door S. H. Koorders, Houtvester.

Manilla Hemp.

We have before us, one in the *Révue Agricole* "of Mauritius, the other in the Journal of the Calcutta Agri-Horticultural Society," two short accounts of the cultivation of *Musa textilis*, the plant that yields the well-known manilla hemp of the Philippine Islands. One is by the English Consul at Manilla, and the other published by the Government of India, and appearing in the Journal of the Agri-Horticultural Society of India, is a report by the Extra-Assistant Superintendent of Port Blair.

It appears that the plant requires a rich soil thoroughly weeded, and a heavy rainfall ; it grows better on slopes than on level ground and soil of a volcanic origin suits it best. The young plants are put out from 8 to 10 feet apart and about a foot deep in the ground.

In about three years the plant will be in full bearing, and it reproduces itself by suckers for 15 or 20 years, after which time a new plantation should be made on fresh soil.

The two reports do not agree as to whether the stems should be cut before fruiting takes place ; one says they should on no account be cut down before they fruit ; the other says that if the plants are allowed to bear fruit their fibre yielding qualities are lost.

The value of the fibre depends chiefly on the careful manner in which it has been dried, the sun and wind being the chief elements to consider, and rain being avoided, as the colour would be spoiled.

It is calculated that one acre of plantation will yield from Rs. 100 to Rs. 110 per annum, from which must be deducted the cost of cultivation, manufacture and packing. The cultivation of this plant which is chiefly conducted by Spaniards, is lucrative, but the conditions of living in the country are hard and a stranger would experience many obstacles and difficulties at the outset. We gather that it is intended to attempt growing the plant in the Andaman Islands.

A. S.

V.-SHIKAR.

A trip to Bara Bangahal.

15*th May.*—Dharmsala to Palampur, 22 miles along a stony road skirting the base of the Dhaulá Dhár Range which forms the boundary between the Chamba State and the Kangra District and which is covered with snow during 6 to 8 months of the year. The first Dâk bungalow *en route* is Dádh, a tumble-down old building overlooking a deep ravine which is crossed by a ricketty bridge. About two miles beyond this, the road passes through the Gopalpúr Tea Estate, one of the most picturesque gardens in the Valley, situated on the undulating lands below the Pattyar ridge, which is thickly covered with Pinus longifolia with a quaint old Fort on the top. At Gopalpur, the weary traveller, be he friend or stranger, will ever receive a warm welcome from its hospitable Manager. Palampur, the head quarters of the Tehsil, is an exceedingly pretty little Station situated in the middle of a Pinus longifolia forest which is cut up by the many slate covered buildings dotted about over it. An exceptionally pretty little Church, and well kept churchyard, a dâk bungalow, and Sessions house, the Kangra Valley Planters' Club, Tehsil, Post Office, and a School, a Masonic Lodge, Hospital and a Planters' bungalow, built on the pattern of an English country house, form this little Station.

16*th May.*—Palampur to Lanode, 10 miles, along a very rough riding path through Oak, Rhododendron and Pine forests. For about a third of the way the path skirts several Tea plantations, all neatly kept, and well cared for The view of the undulating valley below is lovely, the Tea Gardens neatly laid out, with their avenues of fruit and other trees, and the picturesque houses of the ever cheery and hospitable planters dotted about this green ocean of tea bushes, all help to form a truly pleasing sight. Arrived at Lanode I received a warm invitation from the Manager of the Lanode Tea Estate which I gladly accepted, for with such cheerful company, and such genuine hospitality, the stay at Lanode was a pleasant incident not to be forgotten.

17*th May.*—Lanode to Dūdring flats about 12 miles along a narrow mountainous path with many nasty places to cross Left the ponies and heavy luggage at Lanode. Left Lanode about 5 A. M. and reached the Manbai Góte about 9 A. M., breakfasted here, and then started to finish the rest of the journey which was a steep pull up the whole way to Dūdring, got in by

4 o'clock P. M after seeing some Pine forests *en route*. The lovely cool air and wild rocky scenery would cheer the hearts of most men, but when added to this is the knowledge that the wandering shikari is now in the land of bears, kurt and chamois, he truly feels a happy man. The grassy slopes all round are overrun with flocks of sheep and goats on their way up to the Alpine grazing grounds where they spend the whole summer, so the deer tribe have moved higher up into the rocks and crags. Saw several lovely Moonals and Argue pheasants, which appear to know it is the close season and let one get quite within shooting distance of them.

18th May.—Started at 4 a. m. to cross the Lanode Pass about 13,500 feet, the approach to which is decidedly dangerous, and consists of a narrow path over very rocky and precipitous ground, occasionally the path dwindling down to mere crevices along shelving rocks. It was a cold windy morning with a nasty drizzle, and under the advice of the the hill men, the crossing of the pass was delayed till the afternoon. Reached the Jalsu Flats on the other side of the Lanode Pass about 4 p. m. The country all round was under snow, and looked very beautiful. After pitching tents, we went in search of bears, but owing to a heavy hail storm, had to return to camp, having seen only a musk deer. The gently sloping hillsides with their snow-covered crowns, below the snow line the emerald green carpet of short luxuriant grass, covered thickly with the most beautiful wild flowers, the small dwarf rhododendron with its lovely flowers in full blossom and the copper-colored oak dotted about in small groves, all help to form a perfect paradise for any one fond of jungle life.

19th May.—Halted at Jalsu, rain all day. Saw fresh tracks of bears.

20th May.—Started at 5 a. m. for Yarra. Directly on arrival at Yarra, saw two splendid brown bears high up the hill to the west of the wood, one of them was a real fine beast, but they were on the move and got into the thick forest cover before I could get up to them. Late in the evening saw another bear across the ravine some distance away, so had to leave him to himself.

21st May—Halted at Yarra to-day to dry tents, &c and send across the Pass for more provisions for the coolies. Up at dawn and up over the hills. Saw my friends the bears of the previous day. After a fearful pull up to the spot where they had been first seen, found to my disgust that they had vanished apparently into mid air ! for they certainly had not crossed the ridge which I had carefully watched. Directed the Shikaries to search a grove of Blue Pines in the *nala* below ; they reported nothing in the grove, so I climbed up to the top of the ridge to hunt for the bears in the snow, while doing this the Shikaries below shouted that the bears had broken from the Pine grove and were coming up the hill towards me. After a terrible run along the slippery hill-side, resulting in many nasty tumbles, I got within 60 or 80 yards of

one of the bears and had a quick running shot at him but missed him clean, and he was soon over the ridge and into dense cover below. Utterly disgusted with myself I scampered down the hill again, and tried to comfort myself with breakfast, which consisted of cold "dál bhát" and devil grill. After breakfast, visited the remains of what had once been a lovely Deodar Forest, but had been recklessly cut down years ago by the traders who obtained their timber from the Chamba Forests, before the Forest Department leased them. While seeing the forest, we were caught in a heavy shower of rain and got soaking wet, so determined to hurry back to camp, saw a black bear far down the hill, but we were too wet and miserable to go after him.

22nd May.—Still at Yarra; no supplies have arrived. Saw another bear high up the ridge: again a long tramp and no success. Received a post and did office work all day.

(*To be continued.*)

F. O. L.

VI.—EXTRACTS, NOTES AND QUERIES.

Report on the Timber Trade of Bosnia and the Herzegovian.

The superficial area of Bosnia and the Herzegovina is 51,155 square kilometres. (12,641,133 acres) of which more than half, that is to say, 26,793 square kilometre. (6,620,954 acres), is reckoned as forest. A great part, however, of this so-called forest is mere brushwood, while other parts, owing to centuries of neglect and reckless cutting under the Turkish Government, have been so devastated as to be almost valueless at present as regards their timber.

In the beginning of this century the Bosnian bank of the Save was well wooded with oak, ash, elm, and lime trees, but the facility of carriage by water tempted foreign speculators, and it is only now on looking to the left or Austrian bank of the river that one realises what these forests must once have been

In the more mountainous parts of Bosnia and Herzegovina, far removed from the waterways, there are still extensive forests of very fine timber, in some parts even untouched yet by the axe. In the north, oak, fir, and beech predominate, in the south and west beech and various coniferæ.

It was only about the year 1830 that the timber trade in Bosnia commenced, and it was confined to the production of oak staves as requiring neither costly establishments nor carriage roads. These Bosnian staves acquired very soon a certain reputation on the foreign markets and were known in France as "Merrains de Bosnie" or "Bois unis," this latter term being merely a corruption of the word "Bosnie." In England all staves coming from Austrian ports were known as Bosnian staves.

When the large trees of the plain were all cut down, recourse was had to the smaller ones of the mountains, especially in the vicinity of the watercourses such as the Bosna, Una, Ukrina, and Krivaja, all of which either directly or indirectly flow into the Save. Once in the latter river the staves were loaded on boats and taken to Sissek and up the Kulpa to Karlstadt, whence they were sent by cart to the shores of the Adriatic.

The oak found in the hilly parts of Bosnia is the Quercus robur; only as rare exceptions in certain marshy places are found specimens of Quercus pedunculata, which is of quicker and larger growth than Quercus robur. The Quercus robur of Bosnia is of particularly slow growth. A tree 250 years old does not measure more than 45 centimetres (17¾ inches) in diameter, and trees rarely attain a diameter of 65 centimetres 25½ inches). Those that do, already show signs of decay. The wood is softer and less durable than the oakwood of Slavonia, but on the other hand it is more elastic and easier to work. In Slavonia it is not uncommon to find trees up to 130 centimetres (51 inches, but on the right bank of the Save none such are now, at least, to be found. The Bosnian staves, consequently, run somewhat smaller than the Slavonian staves The latter average about 4·90 inches in breadth and the former only 4·70 inches.

A forest law, dated the 11th Shewal, 1286 (January 1, 1870), existed in Bosnia under the Turkish Government, but it was never put in force, nor were there any forest employés. When the Austrians occupied the country in 1878 measures were immediately taken for the preservation of the forests from further devastation, and a forest law was drawn up based on the Turkish one above alluded to.

The present annual cost of the Forest Department is about 200,000 fl. (16,666*l.*), but there are still far too few forest guards —not more than 300—to maintain an efficient control over the vast forests of these provinces.

By the new Austrian law, all the forests in Bosnia and the Herzegovina were proclaimed to be State property, unless the ownership of private persons or of the Vakuf could be clearly authenticated. A special commission was appointed to carry out this work, which is yet far from being completed. The forests are classed under the four following heads:—State property; unrestricted rights; and private property charged with certain Vakuf (Mussulman Church property; private property with communal rights

The peasants are allowed, as before the Austrian occupation of the country, to cut wood and to make charcoal for their own use in the State forests in the vicinity of their abodes without payment, and have also the right of pasturage therein for their cattle. On all wood cut and charcoal made for sale they have to pay a tax.

For some years after the Austrian occupation the timber to be cut was sold by public auction, previous notice of the intended sales being given in the newspapers, but the system has been abandoned of late in favour of private sales.

Sales up to the value of 50 florins (4£. 3*s.* 4*d.*) can be concluded by the district authorities (Bezirksämter), and up to 600 florins (50£.) by the Departmental authorities (Kreisämter), but above that amount, only by the Central Administration at Serajevo.

The largest sale was made in the year 1886 to the house of Morpurgo and Parente, of Trieste. This house has lately failed, but the agreement with the Government is being carried out by the house of Rothschild. According to the terms of this agreement, which was to run for 10 years, Morpurgo and Parente were to cut annually not less than 25,000 and not more than 75,000 oak trees, at a maximum price for those over 50 centimetres (19·7 inches) in diameter, and a minimum price for those between 45 centimsetre (17·7 inches) and 49 centimetres (19·3 inches). Payment is made annually, half in October before the cutting begins and the other half in March before exportation.

The forest receipts for the current year were put down in the budget for Bosnia and Herzegovina laid before the Austro-Hungarian Delegations at 483,200 florins (40,266£.) and for the coming year at 488,200 florins (40,683£.) but the amount actually received must be far in excess of these figures. Morpurgo and Parente alone pay annually about 750,000 florins (62,500£), and Schesinger, of Agram, 250,000 florins (20,833£), and the total annual receipts from forests certainly exceed 100,000£.

The cost of the staves to the cutters, of course, depends very much on the position of the forest where they are cut, and the distance they have to be carried eithertothe railway or to a navigable river. For instance, a thousand staves cut near the Save would probably not cost more than 50 frans (2£.) delivered at the frontier, whereas the same number from the interior of Bosnia would cost as much as 250 fr. (10£., It is reckoned that in Bosnia three-quarters of the price of a stave goes in freight, and in Slavonia less than half. To reduce this cost, Morpurgo and Parente have constructed more than 200 kilometres of narrow gauge railway, at a cost of over 60,000£., to bring down their staves to different points on the Brod-Serajevo line. This firm has been spending annually in Bosnia in this business about 3,000,000 flourins (250,000£), of which 750,000 florins (62,500£.) are paid to the Government for the trees. It employs 3,000 workmen, almost entirely natives of Carniola and the Croatian frontier, whose

specialityis the cutting of staves. They work in gangs of eight or ten, and are paid so much per thousand for staves 36 incheslong, 4 inches to 6 inches broad, and 1 inch thick, A good workman in Slavonia cuts about 10,000 staves in a season, and is paid 20 florius (33*s.* 4*d.*) to 22 florius (36*s.* 8*d.*) per thousand. In Bosnia, owing to the mountainous nature of the country, the severity of the weather, and the rugged growth of the trees, he cannot cut more than 6,000 to 7,000, and is paid 36 florius (60*s.*) to 38 florius (63*s.* 4*d.*) per thousand. Cutting only takes place during the winter months, and ceases at the end of April.

The staves are mostly sold either at the nearest station of the Bosna Bahn (Brod-Serajevo line) or at Sissek, which is the principal market for this article, whence they are sent by rail to Fiume or Trieste for shipment.

The rate of carriage by rail in Bosnia for staves is 25 kr. (4½*d.*) per kilometre for a truck load of 10 tons. Between Brod and Fiume the rate is only 13 kr. (2$\frac{8}{5}$ *d.*) for the same quantity and distance. The cost of carriage on a thousand staves from Doboj on the Bosna Bahn to Fiume is about 3£.

The sales are always effected for ready money without discount, and the French dealers, who are the best customers, even make considerable advances.

Besides Morpurgo and Parente, who are, however, by far the largest cutters, the following firms have also agreements with the Government :—

Carl Schlesinger, of Agram ;
L. Blazic, of Sissek ;
Milic and Sons, of Banjaluka ;
Brabetz, of Gradiska ;
Volks-Actien Bank, of Serajevo.

There has been an enormous increase during the last five years in the number of staves exported from Bosnia, as will be seen from the following table :—

Year.	No. of Staves Exported.
1886	2,500,000
1887	6,000,000
1888	8,000,000
1889	14,000,000
1890	26,000,000

I believe these figures to be even below the mark, and have heard last year's exportation estimated at as much as 30,000,000 The average price per thousand, delivered at the frontier, during this period, may be put down at not less than 225 fr. (9£.). The value of this trade has therefore risen, at the lowest estimate, from 22,500*l.* in 1886 to the very considerable sum of 334,000£. in 1890.

About 90 per cent. of the staves produced are what are known in the trade as French staves, and the remaining 10 per cent. as

German staves, these latter being larger, thicker, and more coarsely cut for the manufacture of large barrels.

France takes nearly three-quarters of the number exported. The next best customer is Italy, and then Algeria, England, Portugal, and Spain, in the order here given.

The staves for France are principally shipped from Fiume and those for Italy from Trieste. Fiume would be a more natural port for Italy and the cheapest to reach with the staves, but as they are chiefly loaded on small Italian sailing craft these latter prefer Trieste, for which port it is easier to find a cargo from Italy.

Fiume, however, is rapidly supplanting Trieste as a port of shipment for staves. In the last 10 years the annual exportation from Fiume has risen from 2,500,000 staves to 48,000,000 staves, while the exportation from Trieste has fallen from 41,000,000 to 13,000,000.

Trieste and Fiume being no longer free-ports, and the interior of Bosnia having been brought into direct railway communication with the Adriatic by the completion of the Serajevo-Metkovic line, unforeseen changes in this trade may not unlikely occur much to the detriment of the above-mentioned ports.

The trade in staves is said to be passing through a very critical period. The production is ever increasing, but not the demand, and the capital engaged bears at present but a low interest. There is also the fear that the oak forests of Thessaly and Asia Minor, which are as yet untouched, may prove dangerous rivals to those of Bosnia and Slavonia.— (*Foreign Office publication.*)

A Burmese Axe-head wood.

Mr. J. W. Oliver sends us specimens of a tree called 'Tamalan' in Upper Burma. We identify it as a new species of *Dalbergia* near *stipulacea* which is rather strange as that species is a climber usually. Mr. Oliver says that 'Tamalan' wood is largely used for axe-heads, the steel cutting edge being let into a piece of it just as the flint axes of the stone age used to be made. The wood is said to be very tough and indeed it must be to stand work as part of an axe-head. It is a hard radish wood more like that of some South American Dalbergias than that of our Indian Blackwood Sissue.

How nutmegs are grown.

A large stock of the very finest nutmegs for seed has been imported by Jamaica from Grenada, and has been sown in the Hope Gardens and, when ready for distribution, will be sold at the very low rate of three halfpence each in large or small quantities. It is hoped that these arrangements will tend to develop the planting of nutmegs on a large scale in suitable districts in Jamaica. Already one order has been fixed for ten thousand plants and another for five thousand.

The germination of the seed in large quantities and the care of the seedlings requires the strictest attention to prevent extensive loss. From the seed-bed the seedlings are transferred to bamboo pots, and, when they have quite recovered from the transplanting and have formed good roots they are ready for the nutmeg plantation.

Nutmeg trees require a deep, rich, loamy soil, moist but not swampy, with a humid atmosphere. They thrive best in steamy river valleys from the sea level up to three hundred or four hundred feet, but they will grow in favourable situations up to an elevation of two thousand feet. The trees should be placed at distances of twenty-five to thirty feet apart, and if the situation is not naturally shady and sheltered, trees should planted for the purpose of breaking the wind as well as for shade. The trees are a long time coming to maturity, not producing a crop as a rule till they are nine years old, and only when they first flower at six or seven years of age it is possible to determine whether they are male or female.

A very small proportion of male trees is left for fertilization by insects, the rest are cut down and fresh plants are substituted. The fertile trees continue to produce fruit for seventy or eighty years. On an average, each three will yield ten pounds of nutmeg and about one pound of mace every year.

The nutmegs are picked up from under the trees every day except Sunday. On being brought into the boucan, the mace is peeled off and pressed flat between heavy blocks of wood, where it is left for two or three days, then put into a case and left till it reaches the proper colour. The nutmegs are put into receptacles (with fine mesh bottoms, so that the air can pass through) inside the boucan, and left there for three weeks or a month.

They are then shown the sun for a couple of hours a day, for two or three days. After this they are cracked. Great care is necessary here, for if the outside shell is struck too hard it makes a black spot in the nutmeg, which affects the value considerably. When cracked, the nuts are sorted according to size, put in to ordinary flour barrels and shipped.—*(Indian Agriculturist).*

The new head of the Woods and Forests Department at the Cape.

The appointment of Mr. D. E. Hutchins as Consulting Forest Officer at head-quarters, is one of the most important made of late, as it virtually means his elevation to the chief post in that branch of the Service, only in lieu of being called Superintendent of Woods and Forests, as was the Comte de Vasselot, Mr. Hutchins will be known as the 'Consulting Forest Officer' of the Agricultural Department. Mr. Hutchins has been connected with the Woods and Forests service since 1869, when he passed 5th out of 85 candidates for the Indian Forest Service, went to the Nancy School of Forestry for three years, and then to Scotland for a special course of forestry instruction. He served in India from 1872 to 1883, when he had reached the high grade of Deputy Conservator of Forests. In that year he was transferred temporarily to this Colony and was appointed Conservator of Forests, which post he has filled with distinction since. At the International Forestry Exhibition in 1884 Mr. Hutchins was awarded a diploma for a collection of Cape woods. In 1889, Mr. Hutchins published a highly interesting brochure on "Our Climate, Cyclical Variation, and Sun Spots" in this paper, which was reprinted in book form and circulated throughout the world. During 1890, Mr. Hutchins visited Europe and visited the French and German forest schools and forests and was specially impressed with the great improvements introduced into the German forestry system. Mr. Hutchins surveyed the face of Table Mountain on his return from Europe in August last and reported favourably on its reforestation. We tender our sincere congratulations to Mr. Hutchins on his promotion.—*(Wynberg Times.)*

VII.—TIMBER AND PRODUCE TRADE.

Market rates for products.

Tropical Agriculturist. 1st July, 1892.

Cutch	per cwt.	24s.	to	34s.
Croton seeds	„	15s.	to	20s.
Gum Kino	„	70s.	to	72s 6d.
India Rubber, Assam	per lb.	1s. 6d.	to	2s. 2d.
„ Rangoon	„	1s. 8d.	to	1s. 10d.
Myrabolams, Bombay	per cwt.	9s. 3d.	to	10s. 3d.
„ Jubbulpore	„	8s. 6d.	to	9s. 6d.
„ Godavari	„	9s. 3d.	to	10s. 3d.
Nux Vomica, good	„	9s.	to	10s 6d.
Orchella „	„	20s.	to	25s.
Red wood	per ton	£3.	to	£3-10s.
Sandal wood, logs	„	£35	to	£60
„ chips	„	£9	to	£30
Sapan wood	„	£4	to	£7

Statement of average selling rates of timber and bamboos in Meerut, Cawnpore, Bulandshahr, Pilibhit, Bareilly, and Moradabad for the quarter ending 30th June, 1892.

Description.	Timber Scantlings per score.		Bamboos per 100 score.		Remarks.
	From	To	From	To	
MEERUT.	R. A. P.	R. A. P.	R. A. P.		
Sal 10′ Tors (Poles) ...	8 0 0	18 0 0	...	...	
Sal Karris, 12 × 5″ × 4″ ...	25 0 0	40 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	8 0 0	10 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	28 0 0	80 0 0	
CAWNPORE.					
Sal 10′ Tors (Poles) ...	5 0 0	6 0 0	...	...	
Sal, Sain &c. Karris, 12′ × 5″ × 4″	9 0 0	10 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	2 8 0	3 0 0	...	...	
Bamboos of 9′ to 10′ per 100 score ...	...	...	20 0 0	30 0 0	
BULANDSHAHR.					
Sal 10′ Tors (Poles) ...	...	...	...	...	
Sal, Sain &c., Karris, 12′ × 5″ × 4″ ...	...	...	...	...	
Sal bed posts, 7′ × 2½′ × 2½″ ...	...	...	...	..	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	50 0 0	
PILIBHIT.					
Sal 10′ Tors (Poles) ...	40 0 0	70 0 0	...	...	
Sal Karris 12′ × 5″ × 4″ ...	30 0 0	40 0 0	...	...	
Sal bed posts 7′ × 2½″ × 2½″ ..	5 0 0	6 4 0	...	...	
Bamboos of 9 to 10′, per 100 score ...	...	...	60 0 0	100 0 0	
BAREILLY.					
Sal 10′ Tors (Poles) ...	5 0 0	10 0 0	...	..	
Sal Karris, 12′ × 5″ × 4″	25 0 0 50 0 0	35 0 0 60 0 0	... ..	... ...	
Sal bed posts 7′ × 2½″ × 2½″ ...	10 0 0	15 0 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	137 8 0	
MORADABAD.					
Sal 10′ Tors (Poles) ..	20 0 0	22 0 0	...	...	
Sal, Sain, &c., Karris, 12′ × 5″ 4″ ...	30 0 0	50 0 0	...	...	
Sal bed posts, 7′ × 2½″ × 2½″ ...	10 0 0	12 8 0	...	...	
Bamboos of 9′ to 10′, per 100 score ...	...	...	50 0 0	100 0 0	

III.—EXTRACTS FROM OFFICIAL GAZETTES.

1.—Gazette of India.

1st July, 1892.—No. 840-*F*.—The following transfers are made in the interests of the public service :

(*i*) Mr. E R. Murray, Deputy Conservator of Forests, 4th grade, sub *pro tempore*, Punjab, to the Madras Presidency as permanent Deputy Conservator, 4th grade.

(*ii*) Mr. C. Somers Smith, Assistant Conservator of Forests, 2nd grade, Madras Presidency, to the Punjab.

7th July, 1892.—No. 509.—With reference to Notification No. 189, dated the 22nd March last, Mr. C. G. Rogers Instructor at the Forest School, Dehra Dun, was on privilege leave from 30th March to 28th June 1892 (both dates inclusive.)

2.—Madras Gazette.

22nd June, 1892.—No. 284.—Mr A. W. Lushington, Deputy Conservator of Forests, Madras, has been granted by the Right Honorable the Secretary of State for India an extension of three months leave on medical certificate, in continuation of the leave notified at page 1117, Part I of the *Fort St. George Gazette*, dated 1st December, 1891.

4th June, 1892.—*Promotions*.—The following promotions and transfers are made in the staff of Upper Subordinates of the Forest Department of the Northern Circle :—

Name.	Present grade.	Grade to which promoted.	Nature of promotion.	Remarks.
L. Hanumanthulu.	Forester, First Class.	Ranger, Fifth Class.	Acting.	With effect from 1st May 1892, *vice* Ranger M. Rathnasami Pillai, suspended
K. Aswatham Naid.	Do. Second Class.	Do.	Do.	With effect from 1st May 1892, *vice* Ranger Balaji Singh, temporarily reduced to Forester.

Transfer.—

Name.	From district.	To district.	Remarks.
L. Hanumanthulu ...	Bellary ...	Ganjam ..	

17*th June*, 1892.—P. R. Rath Nasami Pilley, Forest Ranger, Fifth Class, Godavari District, is reduced to Forester, First Class, with effect from 27th April 1892.

19*th June*, 1892.—L. Hanumanthulu, Acting Ranger, Fifth Class, is confirmed in the same appointment from 1st May 1892, *vice* Ruthnasami Pillai, reduced to Forester, First Class.

22*nd July*, 1892.—No. 326.—Mr. P. M. Lushington, District Forest Officer, Kurnool, privilege leave for three months, from or after 19th July, 1892, under article 291 of the Civil Service Regulation, 2nd Edition.

25*th July*, 1892, No. 327.—Mr. J. T. Lever, Deputy Collector, Fifth Class, to be Special Forest Settlement Officer for the Godavari, Kistna and Kurnool Districts.

3.—BOMBAY GAZETTE.

28*th June*, 1892.—Messrs. C. Fawcett and George Scott respectively delivered over and received charge of the Revenue, Magisterial and Forest Settlement work of the Mán, Khatáv and Khánápur Tálukas in the Sátára District on the 31st ultimo, in the afternoon.

4*th July*, 1892.—No. 2756.—Mr. R. P. Ryan, Deputy Conservator of Forests and Divisional Forest Officer, Kolaba, is allowed privilege leave of absence for one month and thirteen days from the 15th June, 1892.

4*th July*, 1892.—Messrs. F. H. Silcock and A. Lucas respectively delivered over and received charge of the office of the Forest Demarcation Officer, Dángs, and Assistant Poltical Agent, Khandesh, on 20th ultimo, in the forenoon.

4.—BENGAL GAZETTE.

9*th July*, 1892.—No. 2592.—In consequence of the change of the designation of *Sub-Assistant Conservators of Forests* to that of *Extra-Assistant Conservators of Forests*, prescribed in the Government of India, Revenue and Agricultural Department, Circular No. 18F., dated the 29th July, 1891, it is hereby notified that the latter title should be substituted for the title of Sub-Assistant Conservators, wherever it appears in the Notification of this Department, dated the 14th October, 1890, published at pages 997-98, Part I of the *Calcutta Gazette* of the 15th idem, conferring the powers of "Forest officers" therein specified on certain officers of the Forest Department.

18*th July*, 1892.—No. 2719.—Mr. Alfred Hailes Mee is appointed to officiate as an Extra-Assistant Conservator of Forests of the fourth grade on a pay of Rs. 100, with effect from the 1st April, 1892.

Mr. Mee is posted to the Sunderban Forest Division.

11*th July*, 1892.—No. 2719.—Mr. F. Trafford, Assistant Conservator of Forests, attached to the Singbhum Forest Division, is granted three months' examination leave, under section 59J. of the Forest Department Code, with effect from the 1st July, 1892, or from such subsequent date as he may avail himself of it.

5.—N. W. PROVINCES AND OUDH GAZETTE.

29th June, 1892.—No. 3065.—Mr. B. B. Osmaston, Officiating Deputy Conservator of Forests, Central Circle, special leave for four months and nine days, with effect from the 17th June 1892, or subsequent date

29th June, 1892.—No. 3069.—Mr. J. M. Blanchfield, Extra Assistant Conservator of Forests, in charge of the Kumaun Forest Division, to hold charge of the Ganges Forest Division, in addition to his other duries, during the absence on leave of Mr. B. B. Osmaston, or until further orders.

30th June. 1892.—No. 572.—The Hon'ble the Lieutenant-Governor and Chief Commissioner is pleased to declare the undermentioned gentlemen to have passed the Departmental Examination of Junior Officers held on 18th April 1892 and following days in the subjects specified below :—

IV.—FOREST OFFICER.

Forest Law.

Mr. J. C. Tulloch, Assistant Conservator of Forests.

Vernacular.

By the Higher Standard.

Mr. J. C. Tulloch, Assistant Conservator of Forests.

V.—CANDIDATES FOR THE FOREST DEPARTMENT.

Vernacular.

Babu Baraja Gopal Nandi.

12th July, 1892.—No. 3293.—Mr. N. Hearle, Deputy Conservator of Forests, Dehra Dun Division, privilege leave for two months and twenty-eight days, with effect from 1st August 1892, or subsequent date.

15th July, 1892.—No. 3329.—The undermentioned officer has been granted by her Majesty's Secretary of State for India extension of leave :—

Name.	Service.	Appointment.	Period and nature of leave.
Mr. E. A. Down ...	...	Deputy Conservator of Forests.	Six months' on medical certificate.

6.—PUNJAB GAZETTE.

23rd July, 1892.—No. 342.—Consequent on his transfer to the Mooltan Forest Division, Babu Ladha Singh, Extra Assistant Conservator of Forests, was relieved of his duties in the Kangra Forests, Division on the forenoon of the 20th June 1892.

25th July, 1892.—No. 347.—Mr. A. V. Monro, Assistant Conservator of Forests, and Babu Ladha Singh, Extra Assistant Conservator of Forests, respectively made over and received charge of the Mooltan Forest Division on the afternoon of the 27th June 1892 consequent on the departure of the former on privilege leave for three months.

7.—Central Provinces Gazette.

30th June, 1892.—No. 4345.—The following officers of the Forest Department are declared to have passed the prescribed Departmental Examination in Forest Law :—

Mr. H. S. K. Edie, Assistant Conservator of Forests.

Mr. R. C. Thompson, Extra-Assistant Conservator of Forests.

12th July, 1892.—No. 4673.—Mr. R. C. Thompson, Extra-Assistant Conservator of Forests, is declared to have passed the prescribed Examination in Hindi by the Lower Standard.

8th July, 1892.—No. 2327.—Consequent on the appointment of Mr. A. F. Gradon, Officiating Deputy Conservator of Forests, 4th grade, as Instructor at the Forest School, Dehra Dun [*vide* Government of India, Revenue and Agricultural Department, Notification No. 916-F, dated the 10th August 1891], the following promotions are ordered, with effect from the 16th June 1891 :—

Name.	From	To
Mr. A. W. Blunt ...	Assistant Conservator of Forests, 1st grade, sub. *pro tem.*	Deputy Conservator of Forests, 4th grade.
Mr. M. Muttannah.	Officiating Assistant Conservator of Forests, 1st grade.	Assistant Conservator of Forests, 1st grade, sub. *pro tem.*

No. 2329.—Consequent on the return and transfer to the Central Provinces of Mr. L. A. W. Rind, Deputy Conservator of Forests, 3rd grade, the following reversions and promotions will have effect from the 26th June 1891 :—

Name.	From	To
Mr. G. F. Prevost ...	Officiating Deputy Conservator of Forests, 2nd grade (Berar.)	Deputy Conservator of Forests, 3rd grade (Berar.)
Mr. L. A. W. Rind...	Deputy Conservator of Forests, 3rd grade.	Officiating Deputy Conservator of Forests, 2nd grade.
Mr. H. B. Anthony.	Officiating Deputy Conservator of Forests, 3rd grade.	Deputy Conservator of Forests, 4th grade, sub. *pro tem.*
Mr. A. E. Lowrie ...	Deputy Conservator of Forests, 4th grade sub. *pro tem.*	Officiating Deputy Conservator of Forests, 4th grade.
Mr. A. W. Blunt ...	Officiating Deputy Conservator of Forests, 4th grade.	Assistant Conservator of Forests, 1st grade, sub. *pro tem.*
Mr. M. Muttannah...	Assistant Conservator of Forests, 1st grade sub. *pro tem.*	Officiating Assistant Conservator of Forests, 1st grade.

No. 2331 —Consequent on the appointment of Mr. J. McKee as Officiating Conservator of Forests, Assam [*vide* Government of India, Revenue and Agricultural Department, Notification No. 1024-F, dated the 10th September 1891], the following promotions are ordered, with effect from the 1st September, 1891 :—

Name.	From	To
Mr. G. F. Prevost ...	Deputy Conservator of Forests, 3rd grade, (Berar).	Officiating Deputy Conservator of Forests, 2nd grade (Berar)
Mr. H. B. Anthony.	Deputy Conservator of Forests, 4th grade, sub. *pro tem.*	Officiating Deputy Conservator of Forests, 3rd grade.
Mr. A. E. Lowrie ...	Officiating Deputy Conservator of Forests, 4th grade.	Deputy Conservator of Forests, 4th grade, sub. *pro tem.*
Mr. A. W. Blunt ...	Assistant Conservator of Forests, 1st grade, sub. *pro tem.*	Officiating Deputy Conservator of Forests, 4th grade.
Mr. M. Muttannah.	Officiating Assistant Conservator of Forests, 1st grade.	Assistant Conservator of Forests, 1st grade, sub. *pro tem.*

21*st July*, 1892.—No. 2514 —Mr. A. A. Watson, Assistant Conservator of Forests, has been granted by Her Majesty's Secretary of State for India six months' leave on medical certificate, in extension of the fifteen months' leave on medical certificate granted him by Notification No. 917, dated the 22nd March, last.

. .—Burma Gazette.

20th June, 1892.—No. 199.—Under the provisions of clause (*a*) of section 35 of the Burma Forest Act, 1881, the Chief Commissioner declares that with effect from the 1st January 1893, pyinkado trees standing on any land at the disposal of Government shall be reserved trees within the local limits of the South Tehasserim Forest Division.

No. 200.—Under the provisions of section 37 of the Burma Forest Act, 1881, the Chief Commissioner directs that with effect from the 1st January, 1893—

(i) the following shall be substituted for the clause (*i*) (*d*) of Rule 8 of the rules under the Act :—

> (*d*) such timber is cut, sawn, converted, or removed under and subject to the conditions of a license granted by the Deputy-Commissioner, or Forest Officer of the district, or by any officer empowered by the Deputy-Commissioner in that behalf, in one or other of the Forms Nos. VI, VIA, VII, VIIA, VIII, IXA, and IXB, given in the Appendix to these rules and ;

(ii) in the second line of License Forms VI and VII prescribed by this department Notification No. 14, dated the 21st January, 1892, the words "other than pyinkado" shall be inserted after the words "timber of the unreserved kinds."

21*st June*, 1892.—No. 4.—With reference to Revenue Department-Notification No. 196 dated Rangoon, the 18th June, 1892, Mr. H. N. Thompson, Assistant Conservator of Forests, Chindwin Division, made over, and Mr. H. H. Forteath, Assistant Conservator of Forests, received, charge of the Upper Chindwin subdivision on the forenoon of the 25th May, 1892.

23*rd June*, 1892.—No. 203.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for three months and 14 days is granted to Mr. C. W. Palmer, Deputy Conservator of Forests, with effect from the 8th July, 1892, or the subsequent date on which he may avail himself of it.

No. 204.—Mr. C. R. Dun, Assistant Conservator of Forests, is transferred from Maymyo to the charge of the Bhamo Forest Division.

28*th June*, 1892.—No. 206.—Mr. H. A. Hoghton, Deputy Conservator of Forests, is transferred from Toungoo to the headquarters of the Pegu Forest circle, Rangoon.

29*th June*, 1892.—No. 207.—Mr. W. T. T. McHarg, Assistant Conservator of Forests, is transferred from Moulmein to the charge of the Katha Forest Division.

No. 208.—Mr. P. W. Healy, Extra Assistant Conservator of Forests, is transferred from Moulmein to the charge of the Agency division and the Kado sub-division.

No. 209.—Under the provisions of Article 291 of the Civil Service Regulation privilege leave for three months and 15 days is granted to Mr. E. A. O'Bryen, Assistant Conservator of Forests, with effect from the 1st July, 1892, or the subsequent date on which he may avail himself of it

No. 210.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for three months and 15 days is granted to Mr. C. H. Hobart-Hampden, Deputy Conservator of Forests, with effect from the 14th July 1892, or the subsequent date on which he may avail himself of it.

No. 211.—Mr. H. Carter, Assistant Conservator of Forests, in charge of the Working Plans division, Pegu Circle, is appointed to the charge of the Prome Forest Division in addition to his other duties during the absence of Mr. Hobart-Hampden on privilege leave, or until further orders

30*th June*, 1892.—No. 212.—Under the provisions of Article 291 of the Civil Service Regulations privilege leave for one month is granted to Mr. J. Messer, Assistant Conservator of Forests, with effect from the 9th June 1892.

29*th June*, 1892.—No. 9.—Mr. H. A Hoghton, Deputy-Conservator of Forests, reported his return from the privilege leave granted him in Revenue Department Notification No. 64F., dated the 26th February, 1892, on the afternoon of the 18th instant.

No. 10.—With reference to Revenue Department Notification No. 9, dated 28th June, 1892, Mr. H. A. Hoghton, Deputy Conservator of Forests, assumed charge of his duties at the headquarters of the Pegu circle on the forenoon of the 26th instant.

27*th June*, 1892.—No. 1.—Mr. W. T. T. McHarg, officiating Deputy-Conservator of Forests, made over, and Mr. P. W. Healy, Extra Assistant Conservator of Forests, received, charge of the Agency Division on the afternoon of the 24th June, 1892.

22*nd June*, 1892.—No. 5.—With reference to Revenue Department Notification No. 189, dated Rangoon, the 15th June, 1892, Mr Cuthbert William Berry Anderson reported his arrival at Mônywa on the afternoon of the 21st June, 1892.

13*th July*, 1892.—No. 11.—With referrence to Revenue Department Notification No. 212 F, dated the 30th ultimo, Mr J. Messer, Assistant Conservator of Forests, availed himself of the privilege leave granted to him on the forenoon of the 9th idem.

No. 12.—With referrence to the aforesaid Notification Mr. J Messer, Assistant Conservator of Forests, reported his return from privilege leave on the 9th July 1892, and assumed charge of his duties as Personal Assistant to the Conservator of Forests on the forenoon of the same day

12*th July*, 1892.—No. 4.—With reference to Revenue Department Notification No. 204 (Forests), dated the 23rd June, 1892, Mr. C. R. Dun, Assistant Conservator of Forests, relinquished charge of the Myitgnè sub-division on the afternoon of the 27th June, and assumed charge of the Bhambo Division from Mr. C. W. Palmer, Deputy Conservator of Forests, on the afternoon of the 7th July, 1892.

No. 5.—Mr. C. W. Palmer, Deputy Conservator of Forests, availed himself of the privilege leave granted him in Revenue Department Notification No. 203, dated the 23rd June, 1892, on the forenoon of the 8th July 1892.

No. 6.—With reference to Revenue Department Notification No. 207, dated the 29th June, 1892, Mr. W. T. T McHarg, Assistant Conservator of Forests, assumed charge of the Katha Division from Mr. E. A. O'Bryen, officiating Deputy Conservator of Forests, on the afternoon of the 8th July, 1892.

No. 7.—Mr E. A. O'Bryen officiating Deputy Conservator of Forests, availed himself of the privilege leave granted to him in Revenue Department Notification No. 209, dated the 29th June, 1892, on the forenoon of the 9th July, 1892.

16*th July*, 1892.—No. 182.—At the departmental examinations held at Moulmein, Bhamo, Minbu, and Yamèthin on the 6th and 7th June, 1892, the following Forest Officers passed the examination in Law and Revenue for Assistant Conservators of Forests :—

Mr. S. Carr, Assistant Conservator.
Mr. C R. Dun, Assistant Conservator.
Mr. W. A. Hearsey, Extra Assistant Conservator.
Mr. P. W. Healy, Extra Assistant Conservator.

16*th July*, 1892.—No. 218.—In exercise of the power conferred by section 34 of the Upper Burma Forest Regulation, 1887, the Chief Commissioner extends the provisions of Rule 16 (*c*) of the Upper Burma Forest Rules to the Meiktila district.

19*th July*, 1892.—No. 219.—Under the provisions of section 70 of the Burma Forest Act, 1881, the Chief Commissioner invests Mr. P. W. Healy, Extra Assistant Conservator of Forests, in charge of the Kado Forest sub-division, with the following powers, that is to say :—

(1). The powers of a Civil Court to compel the attendance of witnesses and the production of documents.

(2) Power to issue search warrants under the Code of Criminal Procedure.

(3). Power to hold enquiries into forest offences, and in the course of such enquiries to receive and record evidence.

11.—MYSORE GAZETTE.

23*rd June*, 1892.—No. 111.—Mr. Venkatnarnappa, Sub-Assistant Conservator of Forests, Tumkur District, who was granted privilege leave for two months in Notification No. 474. dated 13th, March 1892, having availed himself of only 48 days thereof, the unexpired portion, *viz.*, 12 days, is hereby cancelled.

28*th June*, 1892.—First Grade Forest Ranger Monteiro is transferred from the Mysore District to the Kolar District to join on his return from the two months medical leave granted him.

Ranger Srinivas Rao, 4th Grade, who stands posted to the Kolar District, is transferred to the Mysore District for being posted to the Gundlupet Range *vice* Ranger Monteiro—To join forthwith.

8*th July*, 1892.—Ranger H Ramaiya, 6th Grade, is promoted to 5th Grade with effect from the 1st instant

The object of this hand-book, which is a reproduction of the article in the Dictionary of Economic Products of India by Dr. G. Watt with additions, is to introduce the Indian PODOPHYLLUM EMODI to notice in Europe, and to give information as to the extent to which, and conditions under which it is procurable. The Indian roots are reported as yielding 12 per cent. of resin, whereas the American roots only yield 4 per cent.

PODOPHYLLUM, *Linn.*; *Gen. Pl.*, *I.*, *45.*

A herbaceous genus of BERBERIDEÆ, which contains in all some three or four species, one met with in North America, a second in the Himálaya, and two in China. The American species, P. peltatum, affords the officinal root of commerce The Indian P. emodi, *Wall*, has hitherto been entirely overlooked as a possible source of the drug, and the Chinese forms, P. pleianthum, *Hance*, and P. versipelle, *Hance*, appear to be only known botanically The generic name is derived from πούς a foot and φύλλον a leaf, in allusion to the resemblance of the leaf of the American species to the feet of certain aquatic birds

Podophyllum emodi, *Wall; Fl. Br. Ind., I, 112;* BERBERIDEÆ.

MAY APPLE or DUCK'S FOOT, sometimes also called the AMERICAN MANDRAKE, RIZOME DE PODOPHYLLUM, POD OPHYLLÉE, *Fr*; FUSSBLATTWARZEL, ENTENFUSS, *Germ.*

Syn.—P. HEXANDRUM, *Royle.*

Vern.—*Pápra, páprı, bhavan-bakra, bakra chimyaka,* HIND; *Paprı, banbakrı, banbakrı, kákra, bankákra, chimyáka, chiyákrı, gul-kákrı, wanwángan,* PB

References.—*Stewart, Pb Pl, 8; Report of Tour in Hazára (Jour. Agri.-Hortı. Soc. Ind, XIV, 55); Aitchison, Flora of Lahoul, in Jour, Lin Soc, X, 71, Kuram Valley Report, Pt I, 32; Pharm. Ind, 11-12; British Pharm., 245; Flück & Hanb, Pharmacog., 36; Flückiger in Sonder-Abdruck aus der Apotheker-Zeitung, 1890, Nos 102, 103; U.S. Dispens., 15th Ed, 637, 1133, 1138, Martindale, Extra Pharm., 288; Garrod, Mat. Med., 103, Per Mat Med (Ed B & R.), 1007, O'Shaughnessy, Beng. Dispens, 170, Bentley, in Pharm. Jour., III, 3nd series, 457, Hooper, in Pharm Jour., Jan 26th, 1889; Bent & Trim, Med. Pl, 17, Dymock, Warden & Hooper, Pharmacog. Ind, I, 69, Watt, Cal Exh Cat., 1883, V., No 929, VI, No 604 Atkinson, Him. Dist. (X., N.-W. P. Gas.), 304, 329, Forbes Watson, Ind Survey, 192; Royle, Ill. Him Bot., 64 and note to 379, Henderson & Hume, Lahore to Yarkand, 309, Settlement Report—Panjab, Simla, App II., H, also p. xlvii; Indian Agriculturist, July 27th, 1889, March 16th, 1890; Treasury of Botany, II., 909; Spon, Encycl, I., 820; Balfour, Cyclop. Ind., III., 238, Smith, Dict. Econ. Pl, 270.*

Note.—Some of the above references are to P. peltatum; but, as they have a direct bearing on the medicinal and chemical qualities of P. emodi, they have been here quoted as worthy of consultation.

Habitat.—A small, erect, herbaceous plant, met with in the higher, rich, and shady temperate forests from Sikkim to Simla, Kashmír, Hazára, Tibet, the Kuram Valley, and Afghánistan. On the main line of the Himálaya it rarely occurs much below 9,000 feet, and ascends to 14,000 feet; but in Kashmír it is said to occur as low down as 6,000 feet. It chiefly abounds on the northern slopes of the outer ranges; but, in the more interior tracts, becomes prolific on any exposure. As far as the

writer's personal experience goes, it is less abundant on the Eastern than on the Central and Western Himálaya. It approaches nearest to the plains of India on the Chor mountain—a high ridge south-south-east of Simla—and is fairly plentiful on the northern forest-clad slopes of the Shalai, north-east of Simla, and on the Nagkanda hill. It becomes abundant farther to the north, namely, on the Murale hill and the Jalauri pass. It is also plentiful in many parts of Kumáon, but seems to attain its greatest degree of prevalence to the west of Simla. In Kulu and the Chumba State there are many mixed forests with their glades almost exclusively covered with this pæony-rose-like herb; and the lower part of the valley leading from the Sach Pass to Kilar in Pangi may be specially mentioned.

DESCRIPTION.—**Podophyllum emodi** may be popularly described as a herbaceous plant with a perennial rhizome, the part above ground being annual. It appears about the middle of April, its reddish succulent stem bearing a pair of curiously reflexed leaves, which droop umbrella-like from the top of the petiole. The stem rises to a height of 6 to 12 inches before the leaves (which attain a diameter of 6 to 10 inches) are fully expanded. The leaves are often quaintly spotted, and give origin in May to a large subsessile pinkish-white flower, which appears to arise from the leaf-stalk of one of the leaves, and to have passed maturity before the leaves have been fully developed. The fruit ripens about August or September, when the leaves have quite faded. It becomes about the size of a small lemon, is of a bright orange colour, and hangs suspended from the stout, naked, and often mottled stem.

Medicine.—The officinal parts of the American plant are the RHIZOME (or underground stem) with its attached cord-like ROOTS. From these rhizomes and roots is prepared the so-called "Resin of Podophyllum." Preparations of the rhizomes are now seldom, if ever, used direct in the practice of medicine: it is the resin or podophyllin that is employed. The British and also the Indian Pharmacopœias direct the officinal resin to be prepared as follows:—"Take of Podophyllum root in coarse powder one pound; rectified spirits three parts, or a sufficiency; water, a sufficiency; hydrochloric acid, a sufficiency. Exhaust the Podophyllum with the spirit by percolation: place the tincture in a still, and draw off the greater part of the spirit. Acidulate the water with $\frac{1}{12}$ of its bulk of hydrochloric acid, and slowly pour the liquid which remains after the distillation of the tincture into three times its volume of the acidulated water, constantly stirring. Allow the mixture to stand for 24 hours to deposit the resin, wash the resin on a filter with distilled water, and dry it in a stove." The resin is further described as "a small greenish-brown amorphous powder, soluble in rectified spirit and in ammonia; precipitated from the former by water, from the latter by acids. Almost entirely soluble in pure ether." In the United States, in addition to the "Resina," there is also an "Extractum Podophylli" authorised to be used officinally. The process of preparation recommended for the resin differs but little from that given above, and the resin is described as of "a bright brown colour, an acrid bitter taste, and a slight odour of the root." A correspondence took place in 1890 in the *Chemist and Druggist* as to the advisability of the British Pharmacopœia method of preparing the resin. A correspondent pointed out that as prepared by him, following the process prescribed, the resin was more often of a much paler colour than that described above. The employment of acid to precipitate the resin was condemned by subsequent correspondents, and alum water recommended instead. The fact that the resin as sold to the dispensing chemist is found to be less soluble in rectified spirit than stated in the Pharmacopœia was contended to be due to a fraudulent or careless high percentage of ash being present in the resin. A sample of resin prepared by Mr. Hooper from the Indian root assumed a pale straw colour; but, doubtless, this may have been due to the process of manufacture which had been pursued, and not to any special peculiarity of the Indian root.

Martindale (*Extra Pharmacopœia*) gives the following brief account of the resin, which, for all practical purposes, may be accepted as expressing the results of the chemical investigations of that substance up to date: "The crude resin may be divided by treatment with ether, which dissolves a portion, and leaves another which is soluble in alcohol, but not in ether. The former has a bright yellow colour, an herby odour and acrid taste; the latter a pale brown colour, is odourless, and has a less acrid taste than the other. The author found little difference in their purgative action. The brown resin was more prompt. The crude resin is a slow and rather uncertain purgative, requiring from 12 to 20 hours to act."

"In a later research by Podwissotzki, he obtains from a chloroformic extract of the root an amorphous principle which is free from the fatty and colouring matter of the officinal resin. This he names *Podophyllotoxin*. It is more certain in its action than Podophyllin, and is given in doses of $\frac{1}{10}$ to $\frac{1}{4}$ grain; to children $\frac{1}{10}$ to $\frac{1}{15}$ grain. It is best administered by dissolving 1 grain in 2 drachms of rectified spirit. Dose, 2 to 12 drops in a teaspoonful of syrup. *Podophyllotoxin* is in its turn capable of being separated into a bitter crystalline acid (*Picropodophyllic acid*), a bitter crystalline neutral body (*Picropodophyllin*), the latter of which is the more medicinally active, and an amorphous substance (*Podophyllic acid*) which is inert."

Cadbury, Power, and others affirm that the medicinal virtue is due to the resin soluble in ether, and that the other resin left behind in the alcoholic medium is comparatively inert. The experiments of Power, Maisch, Quereschi, Podwissotzki, and others prove that Podophyllum does not contain berberine (as was announced by Mayer), or any alkaloid, and that its activity is due to the resin or resins.

Care must be taken in handling the resin in quantity, since it is a powerful irritant, and may produce painful conjunctivitis.

Martindale describes six preparations of Podophyllin as follows:—

1. Pilula Podophyllin.
2. Pilula Podophyllin Composita, U. C. H.
3. Pilula Podophyllin et Quininæ.
4. Tinctura Podophyllin (*Dobell*).
5. Tinctura Podophyllin (*off.*).
6. Tinctura Podophyllin Ammoniata.

Medicinal Properties and Uses.—It is commonly stated that Podophyllin may be given in all cases where mercury is indicated. On this account it is often designated "vegetable calomel." It may be described as a hydragogue carthartic in large doses, and an alterative in small. It has its more specific action on the liver, and differs from jalap or scammony in causing an increased secretion or flow of bile. It is liable, however, to cause severe griping, and is accordingly rarely prescribed by itself, but is combined with other purgatives, and aloes or colocynth are those generally preferred. The *Pilula Podophyllin et Quininæ* is a favourite "dinner pill." It contains sulphate of quinine 1 grain, podophyllin $\frac{1}{4}$ grain, sugar of milk $\frac{1}{4}$ grain, extract of belladonna $\frac{1}{4}$ grain, and extract of socotrine aloes 1 grain. The belladonna is given to check the tendency to griping, and it seems desirable to adopt some such combination. The *Tincture Podophyllin Ammoniata* is described as being a powerful hepatic stimulant, and in large doses a violent purgative. In dropsies, podophyllin is sometimes given in combination with calomel and bitartrate of potash.

Externally applied, the resin of podophyllum acts as a powerful irritant, and, dissolved in alcohol, it is sometimes employed as a counter-irritant.

Trade in Podophyllum Root.—No trustworthy statistics can be discovered either as to the British or the Indian trade. It has often been recommended that England should commence to grow her own root. But to what extent this suggestion has been acted on the writer cannot discover. At present she would seem to draw her entire supplies from America, in which country a very considerable trade may be said to

be done (especially at Cincinnati) in the manufacture of podophyllin. But recently a similar enterprise has been started in England. India apparently imports podophyllin—the root in small quantities only coming to this country. It is thus highly desirable that the Indian root should come to be recognised. Were this done, the importation of American podophyllin would at once be checked, and a large export trade of the native drug most probably established. Lloyd's podophyllin is generally put down in Trade Reports at 7*s.* 6*d.* to 10*s.* a pound in wholesale quantities (*Chemist and Druggist*). Since the Indian root affords 12 per cent. of the resin as compared with the American 4 per cent., some idea of the likely profits from an Indian manufacture of podophyllin may be arrived at. But, should the technical knowledge be wanting in India, there still remains what appears a possible lucrative trade, *viz.*, the exportation of the dried root. It is somewhat surprising that the natives of India, who have discovered so many drugs, should have failed to detect the properties of the podophyllum root. According to Flückiger & Hanbury, the properties of the rhizome as an anthelmintic and emetic have been long known to the natives of North America. Only one Indian writer makes the slightest allusion to the medicinal properties of P. emodi, *vis*, Dr. Stewart. What he says, however, amounts to little: "In Lahoul it seems to be used medicinally." Royle, in his *Himálayan Botany*, remarks: "I know not if the Himalayan Podophyllums possess any of the properties ascribed to the American species, but this could be easily grown." Sir W. O'Shaughnessy only briefly alludes to the drug, remarking that the sample furnished by Dr Falconer "was too small for the requisite experiments being instituted upon its virtues." The *Pharmacopœia of India* says of P. emodi, "its properties may be deserving of investigation." Thus, although the fact that India possesses a species of Podophyllum has been known to Europeans for nearly a century, the root, until recently, has neither been chemically examined nor medicinally experimented with. Nor is it used by the Medical Store Departments of Calcutta, Bombay, or Madras.

The above account of Podophyllum emodi was drawn up in connection with a correspondence which appeared in the Selections from the Records of the Government of India in 1889-90. Since considerable extra information has been brought to light by this and subsequent correspondence, a *précis* of the chief letters may be of public interest.

From the Reporter on Economic Products, to the Secretary to the Government of India, Revenue and Agricultural Department,—dated 4th March 1889.

During a rapid botanical trip into Kúllú in November 1888, I collected some of the roots of a wild plant—**Podophyllum emodi**—with the object of having them chemically analysed. I knew that the resin obtained from the North American plant—**Podophyllum peltatum**—had recently been giving indications of becoming daily a more and more important drug. It, therefore, occurred to me that the Indian species might be found to possess, in a profitable degree, the active principle. Dr. Dymock, Medical Store-keeper, Bombay, was good enough to offer to co-operate with me in the matter; and, thus encouraged, I took some little trouble to discover the plant, though, during the late season at which I visited Kúllú, only portions of the withered leaves could be found. The result has proved highly satisfactory. From the letter below it will be observed that Mr. Hooper, Quinologist to the Madras Government, has discovered, on analysing the roots furnished by me, that, whereas the American root contains only 4 per cent. of the resin, the Indian yields as much as 12 per cent.; and that the Podophyllin thus obtained has been found to possess the same medicinal properties as that at present used in Europe.

Under these circumstances I venture to place before the Government of India the results of the enquiry up to date, in the hope that they may

be deemed of such importance as to justify their publication. It would seem highly probable, as suggested by Dr. Dymock that, with a little encouragement vouchsafed by Government during the initial stage of the proposed new industry, a lucrative trade of the utmost value to the hill tribes of the higher Himálayas might be organised. With this object in view I beg to submit a brief note which will be found to contain the main facts regarding Indian and American Podophyllum, together with the correspondence conducted on this subject.

BOMBAY, *December 26th, 1888.*

You will be pleased to learn the **Podophyllum emodi** is a great success. Mr. Hooper got 12 per cent. of resin (podophyllin) from it, whereas the yield from **P. peltatum** is about 4 per cent. only. Medicinally the resins act just in the same way as the officinal drug.

As Podophyllin is by far the most popular purgative at the present time, your Department should take steps to collect some, and put it in the market. A good supply would drive the American drug out of the European market. I enclose a sample of the resin for your inspection.

W. DYMOCK.

From MESSRS. KEMP & CO., Limited, Pharmaceutical Chemists, Bombay, to the Reporter on Economic Products, dated 21st February 1889.

Mr. Hooper, Government Quinologist of Ootacamund, has referred us to you with the view of obtaining a supply of the rhizomes of Podophyllum emodi which he, in conjunction with Dr. Dymock, has found to contain a large percentage of Podophyllin. We should be glad of obtaining a preliminary supply of about 20lb. As it is stated to grow very plentifully, we presume that it could be obtained at a low rate.

Aconitum ferox and **Napellus**, **Nardostachys Jatamansi**, and **Ophelia chirata** we obtain in the Bombay bazaar; but, if they could be obtained at a lower rate from Simla, we should be glad to purchase direct. Any information regarding these and other drugs in ordinary use would greatly oblige.

Extract from the Reporter on Economic Products' reply to the above, dated March 4th, 1889.

I am laying the correspondence before Sir E. C. Buck, Secretary to the Government of India in the Revenue and Agricultural Department, and shall, I trust, be able to report shortly. I shall also draw up a detailed note on the subject, which very probably the Government may consider of such importance as to permit me to publish it in the Selections from the Records of the Government of India which I edit. Such a note would set forth the localities where the plant occurs, and might thus be expected to bring to light many persons who would be willing to collect or sell the root. It is probable that private enterprise would prove commercially more satisfactory than official. In bringing a new drug into the market I am well aware that high prices are not likely to be paid at first, but, as the root occurs abundantly at some distance from Simla only and would thus have to bear heavy coolie charges, it would be of great value to know the price you would be disposed to offer, and the amount approximately you would be prepared to purchase annually. It might be thought worth while to cultivate the plant in some of the forests where now it exists but sparingly, so as to have at hand a larger supply than could be procured except from the more distant forests.

Extract from a letter received from SIR B. SIMPSON, *Surgeon-General, dated 20th March 1889.*

If the Indian plant yield so much as 12 per cent. of Podophyllin resin, and if the resin be of as good quality as the American drug, the initiation of a trade in the Indian drug will require very little help from Government.

In order to discover whether the Indian root, as is the case with the American, possessed the greatest amount of Podophyllin when in fruit, the writer visited, during March 1889, one of the Simla habitats of the plant, and collected some of the roots. These were forwarded to Dr. Dymock, and the following passage from the reply he was good enough to furnish would appear to settle that point :—

Extract from letter by Dr. Dymock, Bombay, May 17th, 1889.

The root of Podophyllum emodi last sent contains 6 per cent. of resin. It gives just as much spirit extract as that collected when in fruit, so it must contain a larger proportion of sugar and other nutritious materials stored up for the use of the growing plant. The root must, therefore, be collected when the plant is in fruit.

Captain C. W. Losack at Gulmarg in Kashmír forwarded specimens of the plant in August 1889. In his letter accompanying these he says :—

The specimen sent was collected here at an elevation of 8,000 feet. It is not sufficiently abundant to make its collection remunerative. I learn, however, that it is very plentiful in other localities of Kashmír which I hope to visit shortly.

Several Mercantile firms having asked the Reporter on Economic Products whether he could procure for them a supply of the roots, the following reply was issued :—

In my office I have no agency by which I could undertake to collect the root. My connection with this or any other product must be confined to merely placing in the hands of the public the facts I am able to collect regarding the products. But I shall be very pleased to be of any service in that direction; and, should you establish an agency of your own for collecting the root, I will further your views by furnishing your collector with a dried specimen of the plant, and by identifying his collections until he has been trained to recognise the plant. There are many localities where it grows—the Black Mountains are literally covered with the plant. It is fairly plentiful in Garhwal and Kumaon; but in Pangi on the Chenab (a tract of country belonging to the Rája of Chamba) it is particularly plentiful, especially in the valley leading from the Sach Pass to Kilar. There is a Forest officer in Kilar and Pangi; and perhaps he might be willing to procure the root for you. Although the plant occurs in the Simla district, it would most probably not pay to collect it here unless the people could be induced to cultivate the plant. I have a few plants of it growing in pots in Simla now, and have no fear as to the possibility of its succeeding as a regular crop, if the price paid for the root would prove remunerative.

In October 1889, the Reporter on Economic Products received, through the Conservator of Forests, Panjáb, two sets of specimens accompanied by letters of explanation. It is perhaps unnecessary to print these letters, since the following extract from the report on the samples analyses the main facts brought to light by the Deputy Conservators in Kúlú and Chamba.

Extract from a report by the Reporter on Economic Products, dated 15th December 1889.

"It is remarkable that both from Kúlú and from Chamba the vernacular names given for the plants forwarded should be almost identical. Unless these names were contained in the official correspondence and were thus adopted, they may prove of considerable use hereafter in identifying the root. In the new *Pharmacographia Indica* Podophyllum emodi is said to be known as *pápra* or *pápri*, also *bhavan-bakra* or *bakra*: hence the authors of that work think it was probably one of the bile-expelling plants described by Sanskrit writers under the names of *parpata* and its synonym *vakra*. The samples marked B. and C. forwarded by the Deputy Conservator of Forests, Kúlú, are Podophyllum emodi, and he reports that on the Rupi Range the plant is called *bankukri*, *gulkúkri*, while in the Seoraj Range it is *gulákra*. Both the Deputy Conservator of Forests, Kúlú, and the Deputy Conservator, Chamba, however, forward fragmentary specimens of the leaves and fruits of a Cucurbitaceous creeper (Zehneria umbellata *var.* nepalensis), with red fruits, which of course is not Podophyllum emodi. It would, therefore, appear that the roots of that creeper possess a distinct medicinal value (since recognised by the inhabitants of two regions so widely distinct) and probably that, like Podophyllum, it is a purgative. As opposed to this idea, however, on microscopic examination, the roots are seen to contain a large quantity of starch, and, according to the Rev. A. Campbell the Santals are said to eat the roots of Zehneria umbellata. These roots require, therefore, more careful study, and they will be examined hereafter and reported on, but it is worthy of note that the creeper should bear in Kullú the names *gulkukru*, *gulale-kukri*, and *gulakri*, while in Chamba the same plant is called *bankákra*, *bankákri*. The singular uniformity in these names, if not the outcome of a suggestion that the Podophyllum plant required bore some such names, would point to both plants having in native minds the same properties.

"Most writers allude to the fact of the fruits of Podophyllum being eaten, but the Deputy Conservator of Forests in Kúlú is the first person to have recorded that the ground root is used as jalap. Hitherto it has always been supposed that the natives of India were ignorant of the medicinal properties of Podophyllum. Now we know that they use the plant as a purgative, the development of trade may be simplified. It seems, however, probable that the word *kákru* or *kákri*, which occurs in all the vernacular names mentioned above, means 'purgative' or 'bile-expelling,' and in that case the danger would have to be guarded against of sending into the market the roots of the Cucurbitaceous plant here noticed."

From Messrs Bertie Smith & Co., Manufacturing Chemists, Bombay, to the Conservator of Forests, Panjáb, dated 12th August 1891.

We beg to acknowledge your favour, and in reply have to say that, compared with the American Podophyllum root, the Indian root contains nearly double the amount of resin, which, however, has slightly different characters. But, as mentioned before, the price it costs to get quite prevents business in your rhizome, for the American is landed in London at two pence per pound. Your root cannot be profitably worked up for Podophyllum, unless it can be delivered to us in Bombay at 2 annas 9 pies to 3 annas per pound. Rhizome and root test are equally useful in the manufacture of the resinoid. You are quite wrong in your impression that Podophyllum root from America is largely purchased in Bombay. Only one druggist in Bombay has a few pounds of that drug in stock, price R1-8 per pound.

Shall we buy 1lb at this rate for you and send it up? The reason is because there is no medicinal preparation in common use made *direct* from the rhizome. All preparations are made from the resinoid Podophyllum itself, which is manufactured in America and Europe, not in India. If you would like us to send the 1lb at R1-8, please send us a post card.

If obtained from England for you, the cost would be half; delivery in two months.

Can you collect a ton of the rhizome, and deliver it in Bombay at the price we name?

Messrs Bertie Smith & Co. wrote further to the Officiating Reporter on Economic Products (December 15th, 1891), to the effect that the great expense of carriage to the Coast for export and manufacture may deter, for some years, the use of the drug *Podophyllin* manufactured from the Indian rhizome, especially as the physiological effect of the medicine seems to be very slightly different to that of the resin obtained from **Podophyllum peltatum.**

Resin has been manufactured from P. emodi by Messrs. Bertie Smith & Co., and sent to their Agents in London with a view to business.

From MESSRS. KEMP & Co., Limited, Pharmaceutical Chemists, Bombay, to the Conservator of Forests, Panjáb, dated 25th July 1891.

In reply to your letter of the 21st current, No. 1044, we have to state that the **Podophyllum emodi** roots you sent us, weighing 7½lb, were treated according to the process described in the British Pharmacopœia for the preparation of podophyllin from the roots of **Podophyllum peltatum**, the American plant. We obtained by this process 8oz of resin, equivalent to 6·6 per cent. As we have previously stated, the American root is supplied at a very low rate. It can be purchased in Europe at four pence per pound. We have recently had an enquiry from a large American firm for the roots of **Podophyllum emodi**, and, if you can furnish a supply at a low figure, we might be able to purchase a quantity for them; but we think the cost of transmitting the roots from the Himálayas to America would exceed the value of the American roots.

A sample of P. emodi resin, prepared by the British Pharmacopœia process, has been sent by Messrs. Kemp & Co. to the Imperial Institute.

In the Progress Report of Forest Administration in the Panjáb for 1890-91, it is stated that sixty-three broken roots of P. emodi, of which the larger portion had been collected for medicinal purposes, were planted at Changlagali in order to test the capabilities of the plant of producing new roots, and the experiment is reported as having proved fairly successful.

One maund of P. emodi roots and rhizomes procured by the Conservator of Forests, Panjáb, has been forwarded to the Imperial Institute for analysis and distribution to leading firms of wholesale chemists.

EDGAR THURSTON,

Offg. Peporter on Economic Products to the Government of India.

G. I. C. P. O. -No. 921 R. & A.—28-7-92.—1,400.—J D'C.